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ABSTRACT

This teacher's manual provides general and specific guidelines for use of Teams-Games-Tournaments (TGT) Physical Science Curriculum materials at the junior high-middle school level. TGT is an innovative instructional model which focuses on the learning of basic skills, information, and concepts, rewarding students in small teams rather than at the individual level. The "games" component consists of a series of learning games; "tournaments" involve weekly sessions in which each student competes with other students of comparable achievement level on other teams; ultimately, individual scores are converted to team scores and winning teams are declared. The manual includes worksheets and gamesheets covering 42 learning objectives classified under these basic units: chemistry, work, force and motion, light and sound, heat, electricity, and measurement. (CS)

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Teachers' Manual:
Using Teams-Games-Tournament (TGT) in the Physical Science Classroom

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Introduction

This manual provides general and specific guidelines for use of the Teams-Games-Tournament (TGT) Physical Science Curriculum materials in the classroom. Part I discusses general issues; Part II provides specific information to enhance the use of the materials for each designated learning objective.

Physical Science is part of the curriculum at the eighth- or ninth-grade level in most schools across the country. These materials were pilot-tested in both eighth- and ninth-grade physical science classrooms.

Before using TGT Physical Science, you should receive training in using the TGT process in the classroom. At the least, you should read and study the teacher's manual, Using Student Team Learning, especially the TGT sections, before attempting to use the process in your science classroom. Also, the materials can be used with the Student Teams-Achievement Division (STAD) process, simply by using the tournament gamesheets as quizzes.

Part I

General Issues

The Purpose of TGT Physical Science

TGT should be used in the science classroom in accordance with its strengths--the learning and reinforcement of basic knowledge that will provide a base for further learning and experiences.

Science classrooms provide students with opportunities for meaningful experiences, which should in turn lead to further inquiry. However, students need a stable knowledge base or cognitive structure within their experience in order to proceed with manipulation and application of their learning. This basic philosophy of use of TGT, when applied to the physical science curriculum, has important implications. The materials focus on what TGT does best--the learning of basic skills, information, and concepts.

For example, the facile use of laboratory equipment is an important feature in science classrooms, but the basic knowledge required before facility--identification of equipment and knowledge of the functions of the equipment--can be taught and reinforced through TGT. Similarly, before students can analyze and synthesize chemical formulae, they must first learn chemical symbols and their meanings.

Another good example is vocabulary. Before vocabulary can be facilely applied, a basic level of knowledge of definitions must be assured and strengthened. Before nuances of meaning can be effectively dealt with, the student must acquire a definition that provides the base for the nuances. Vocabulary drawn from experience and reinforced through TGT will provide such a base.

There is no argument that the primary purpose of middle school-junior high school science programs must be to enable students to experience their world and develop the inquiry and investigative skills that they need to examine and understand that world. This purpose can be greatly facilitated, however, when students are able to develop a base of knowledge from which to launch their inquiry and investigation. The purpose of TGT science is to allow students to build that knowledge base successfully, especially students who may traditionally have difficulty in achieving academic success.

The Teams-Games-Tournament (TGT) Instructional Process

TGT is a classroom instructional process that changes the reward and task structures which surround a student in the classroom. The change in reward structure involves rewarding students as teams as well as individually. Task structure changes are created by having students perform cooperatively in their teams and then in small groups playing instructional games rather than in an isolated, individual setting.

The team structure leads students to encourage each other to learn academic material and to reinforce each other for successful performance, promoting greater learning. The game structure allows each student, regardless of past performance, to have a good chance to succeed at academic learning and to receive recognition for that success. The particular combination of structural changes used by TGT follows directly from research in both social psychology and instructional gaming.

TGT has three components: teams, games, and tournaments. The team component involves assigning students in a classroom to a series of four- or five-member teams. The students are assigned to create maximal heterogeneity within each team (in such dimensions as student academic achievement, race, and sex) and equality across teams. Team membership remains intact over time; within-team interaction and cohesion is fostered by frequently held team work sessions and by assigning teammates to adjacent seats. During team work sessions, the team members work together on worksheets that focus on specific learning objectives.

The games component consists of a series of instructional or learning games. This component consists of weekly (or even twice weekly) game-playing sessions, typically lasting 30 to 50 minutes, in which each student competes with two other students of comparable achievement level, representing other student teams. The instructional games used in the tournaments cover the same material (but only some of the actual items) that the students worked on together in their teams.

At the end of each tournament a "top scorer," "middle scorer," and "low scorer" are declared for each three-person tournament table. The individual student scores are converted to team scores. The team scores are ranked and winning teams are declared. Public feedback is provided periodically through a newsletter which announces individual achievement but which stresses team performance. After each day's play, students are routinely reassigned to different tables for the next tournament based on recent performance, to ensure that all students retain a good chance of winning and thus remain motivated.

The manual accompanying the TGT Physical Science materials, Using Student Team Learning, describes the TGT process more thoroughly and provides specific step-by-step instructions for implementing the process.

Development of TGT Physical Science Materials

The development of these materials followed a model of previous development used for language arts and math materials--essentially, the identification of common and important learning objectives through multiple sources, followed by worksheet/gamesheet development for each objective, followed by formative evaluation of the materials conducted in science classrooms over a full school year. Full details of the development are contained in the final report on the project submitted to the National Science Foundation.

Difficulty Level of Materials

In general, the physical science worksheets and gamesheets are above average in difficulty level--that is, they cover a good deal of information and do so on a more than elementary basis. Some worksheets and gamesheets, of course--depending upon the learning objective--are not as difficult as others.

You should not assume that a certain worksheet/gamesheet or a certain unit may be too difficult for your students. The pilot testing of these materials, and other previous testing of TGT materials, has shown that students working in cooperative teams are capable of learning information that they might not be able to learn, or motivated to learn, on their own.

At the same time, students with genuine reading difficulties will still face the problem of dealing with print materials. In this case, you can assign [illegible], teammates, or parent helpers to provide special assistance. During tournament sessions, you can spend extra time at the low-achiever tables with students who most need your help. In especially low-reading classrooms, you can revise and simplify the materials. Special education teachers have employed TGT science successfully by simplifying the worksheets and gamesheets.

Organization of Materials

TGT Physical Science consists of worksheets and gamesheets covering 42 learning objectives. These objectives are classified under six basic units:

Chemistry
Work, Force and Motion
Light and Sound
Heat Energy
Electricity
Measurement

The complete listing of objectives under each unit is contained in the Appendix of this manual.

Using TGT Physical Science in the Classroom: General Issues

Part II of this manual provides specific information on using each of the TGT worksheet and gamesheet sets. There are, however, some general issues that you should be aware of as you implement the TGT process and materials in your classroom.

1) Schedule of Usage. There is no specifically prescribed schedule for using TGT. A typical weekly schedule consists of, for each learning objective, regular instruction by the teacher on Monday, Tuesday, and Wednesday, team practice on Thursday and tournament play on Friday. Essentially

you select the learning objective to be concentrated on, you teach that objective through regular classroom instruction for the first three days of the week, the students then have team practice sessions on Thursday and the tournament on Friday. The next Monday, you introduce another learning objective and follow the weekly schedule again.

This schedule will vary according to the difficulty of the learning objectives, the ability level of the students, and how much teacher instruction is required to provide information about the objective. For example, the information required for students to learn objective I.4 (Identification of the names and symbols of common elements) is contained wholly within the worksheets and gamesheets, so little preliminary teacher instruction would be needed. The objective could be covered in two classroom periods only--one for the team practice and one for the tournament. On the other hand, to cover objective II.3--application of Newton's law of motion and Bernoulli's principle--the students may need three to five classroom periods of instruction and experimentation before going into the team practice and tournament periods.

Thus, the average weekly schedule will vary according to your assessment of how much preparation your students require before entering the team practice and tournament. Remember, however, that the team practice is a learning period, and students will learn the worksheet information in their teams. They should be sufficiently prepared to be able to learn the worksheet information, but not so thoroughly instructed in it beforehand that it is simply review.

Another aspect of scheduling is the problem of holidays and school events. Most teachers like to run team practice on Thursday and the tournament on Friday. During the school year, however, a lot of Thursdays and Fridays get cancelled out by holidays and school events. During such a week, you may select a relatively easy objective--one that can be covered through instruction on Monday, team practice on Tuesday, and tournament on Wednesday. Or you may select a difficult objective and use a two-week period that includes the holiday to cover it thoroughly. In essence, TGT is flexible--you need to allow a period for team practice and a period for the tournament, but the length of the instructional time beforehand is up to you.

Also involved with scheduling is the use of vocabulary review. Each TGT unit (Chemistry; Work, Force and Motion; Light and Sound; etc.) ends with a vocabulary review. This vocabulary information, however, is generally provided by the teacher at the beginning of each learning objective and the learning of vocabulary is an important part of each objective.

2) Selection of objectives. The 42 learning objectives covered by TGT Physical Science are presented in logical sequential order under each unit and should correlate very well with your present curriculum--that is, you are probably already teaching most or all of these objectives right now.

Your selection of which TGT materials to use will depend upon how extensively you want to use TGT in your classroom. You may, for example, select eight chemistry objectives that match your current objectives and use the TGT process with only those eight. On the other hand, you may want to select enough objectives in each unit to be able to use TGT, off and on, throughout the entire school year. In essence, your needs will determine how much use you make of the materials. You may choose to use them extensively or use them only occasionally to cover specific objectives that are not as well covered by other materials or methods of instruction.

In your determination of their use, you should remember that, although TGT may effectively teach basic information and motivate students to learn basic information, the process and materials provide no hands-on experience or conscious development of inquiry skills. TGT focuses primarily on the knowledge objectives level of Bloom's hierarchy. Some suggestions are made in the specific issues portion of this manual for incorporating experimental and inquiry skill development, but the basic academic purpose of TGT is to enhance the learning of knowledge objectives.

In line with this, it would probably be possible to begin the year with Unit I, Objective 1.1 of the TGT materials and go right through the year with TGT and cover almost all 42 objectives. Students exposed to this schedule would probably show very high scores on standardized and criterion referenced knowledge tests. This would, however, be a misuse of TGT Physical Science. Students learn basic information very well in TGT, but their learning of information must be viewed as providing a base in physical science for the important further development of inquiry skills.

3) Grading. The use of TGT should not change the way that you assign grades in your classroom. You should not grade students on how well they do in their tournament, nor should you give a team grade based on how well the team performs. Your grades should be based on the standard measures that you already use--quiz and test scores, preparation of assignments, and so on. As students are involved in TGT, you should see higher achievement for the class as a whole, and for low achievers especially, on quiz and test scores.

In the STAD team learning process, which can be used with the TGT physical science materials, grading can be based on the actual results of the quiz that is given each week. The STAD process is included in the Using Student Team Learning teacher's manual.

Using TGT Science in the Classroom: General Procedures for Each Objective

Teacher judgment plays a large role in the successful use of TGT science, but the following general guidelines will help you organize your instruction. For each set of worksheets/gamesheets covering each objective, you should:

1. Examine the worksheet/gamesheet materials to see how much information is provided about the objective and how much you will need to provide in your instruction. TGT worksheets do not provide full instructional materials, but are designed to be used with your textbooks, other printouts, and so on. Determine how many periods you will need to devote to instruction and set up your team practice and tournament to follow those periods.

2. As part of your instruction, be sure to present and cover vocabulary definition and usage, especially the vocabulary that is listed on the worksheet. The extent of your coverage should be based on how thoroughly the worksheets/gamesheets cover the vocabulary. The more thoroughly the vocabulary is covered in the worksheets, the less instruction you need to devote to it. However, vocabulary should be covered experientially, not simply as a set of definitions. For example, students need to learn definitions for opaque, transparent, mixture, and suspension in order to verbalize or write out their conceptions of these terms, but the conception itself must be based on experience with the qualities of opaqueness, transparency, mixtures, and suspensions.

3. In your instruction preceding the team practice and tournament, include as many experimental and experiential activities as possible. Remember that the team practice and tournaments are devoted to learning of basic skills and information.

4. In team practice sessions, encourage students to use extra resources, such as models, manipulables, diagrams, charts, and textbooks. You can provide resources to each team or set up a central area of resources that teams can take turns using.

5. Students should be made aware and kept aware that, in science as in life, objective answers to objective questions do not always cover all the possible nuances of a situation. Essentially, an objective answer or statement provides a handle for grasping and examining a concept but does not necessarily fully describe nor explain that concept. For example, definitions of physical change and chemical change are short and specific and very useful, but any particular change may be mostly physical or mostly

chemical and not exclusively one or the other. Along the same lines, we can define what a neutron is in brief, specific terms, and use this definition in writing and verbalizing about atoms, but the definition does not fully cover all the known aspects of the neutron and its relationship to the atom. In essence, students need to learn that objective statements of qualities, concepts, and processes are necessary and useful in order to gain a preliminary understanding, but the preliminary understanding can be deepened and enhanced through inquiry, observation, and experience.

Part II

Specific Issues

This section of the manual provides more specific information for coordinating the use of TGT and your usual instruction or classroom procedures. This information is based on observation of the use of these specific materials in classrooms and the suggestions of teachers who have used the materials. You need not apply all or any of the following suggestions; however, you may find many of them helpful as you implement TGT in the physical science classroom.

Objective

I.1	Laboratory Equipment	Students should have some direct experience with some or all of the equipment before this worksheet/gamesheet is used. Also, instead of using the worksheet, you can set up the actual equipment throughout the room, tag each piece, and have the students work with their teams to identify each piece.
I.2	Physical and Chemical Change	Demonstrate examples of changes prior to using the materials.
I.3	Solutions and Suspensions	Provide samples of the various solutions and suspensions for student examination prior to team practice.
I.4	Element Symbols	Little or no pre-instruction is required.
I.5	Acids, Bases and Salts	Requires pre-instruction on formulas and the properties of acids, bases, and salts.
I.6	Elements, Compounds and Mixtures	Provide samples of the various substances for student examination before team practice.
I.7	Common Elements, Radicals and Compounds	Requires pre-instruction on the nature of radicals.
I.8.1	Periodic Table	Requires pre-instruction in the structure and use of the periodic table.
I.8.2	Atomic Structure	Models and charts of atomic structure will help students realize that the structure is not as regular and orderly as depicted.

I.8.3	Count the Atoms	Team practice and tournament can be shortened --once students understand the counting process, they will go through these materials quickly.
I.9	Properties and Purification of Water	Pre-instruction should include demonstrations and experiments involving boiling, freezing, aeration, distillation, etc., and should include demonstrations in reading of graphs.
I.10	Bonding and Valence	Requires extensive pre-instruction to help students understand the concepts and processes. Models and diagrams should be provided as resource materials during team practice.
I.11	Making Chemical Formulas	During team practice and the tournament, students become very proficient with the mechanical processes involved in producing chemical formulas. Pre-instruction should emphasize student understanding of what is physically and chemically occurring.
I.12	Identify the Reaction	Requires little pre-instruction
I.13	Organic and Inorganic Formulas	Pre-instruction should stress student understanding of concepts of organic and inorganic. Models of molecules and compounds will help students visualize molecular structure. In team practice, students quickly become proficient at deriving molecular formulas.
I.14	Chemistry Vocabulary Review	No pre-instruction required if used at the end of the chemistry unit.
II.1	Simple Machines	Pre-instruction should include demonstrations and hand-on experience with first, second, and third-class levers.
II.2	Ideal Mechanical Advantage	Pre-instruction should include demonstrations and hands-on experience with levers, pulleys, and inclined planes, and demonstrations of inertia, friction, and gravity.
II.3	Laws and Principles of Motion	Provide demonstrations and hands-on experience to illustrate the laws and principles before team practice.

II.4	Density	Include demonstrations and experiments with density. Provide formulas and instruction in use of formulas.
II.5	Energy Conservation	Pre-instruction should focus on student understanding of each form of energy and types of energy convertors.
II.6	Work, Force, and Motion Vocabulary Review	Requires no pre-instruction at end of unit.
II.7	Parts of a Car	If shop facilities are available, have students examine a total car and/or an engine and identify parts as part of their team practice. Pre-instruction can stress function of the parts.
III.1	Light and Matter Relationships	Pre-instruction should include demonstrations and student experience with light and transparent, translucent, and opaque objects. During team practice, students can make up their own list of objects for their team members to identify.
III.2	Refraction and Reflexion	Include demonstrations and experience with mirrors and prisms.
III.3	The Eye	Use a model to give students hands-on experience with parts of the eye. Encourage reference to the model during team practice.
III.4	Producing Color	Set up demonstrations and experiments to to show production of colors.
III.5	Light Vocabulary	No pre-instruction required when used at end of unit.
III.6	Waves and the Ear	Demonstrate wave movement. Use a model of the ear if available. Pre-instruction should stress student understanding of sound waves.
IV.7	Heat Transfer	Pre-instruction should include demonstrations and experiments with heat transfer and with insulators and conductors. In team practice, students can make up lists of insulators/conductors for their team members to identify.
IV.2	Heat and Temperature	Pre-instruction should include student experience with temperature measurement, and demonstrations and experiments with heat and temperature.

IV.3	Heat Graphs	Pre-instruction should include essentials of graph reading and interpretation.
IV.4	Heat Vocabulary Review	Requires no pre-instruction when used at end of unit.
V.1	Electricity	Demonstrate and set up experiments with positive and negative charges as part of pre-instruction.
V.2	Ohm's Law	Pre-instruction should stress student understanding of the concepts of electromotive force, resistance, and current.
V.3	General Circuits	Pre-instruction should include construction and demonstration of series and parallel circuits.
V.4	Electrical Symbols	Pre-instruction should stress functions of the parts of electronic circuits along with identification.
V.5	Electronic Circuits	Pre-instruction should include hands-on experience with radio circuits. with emphasis on functions of the circuit parts.
V.6	Electricity Vocabulary Review	No pre-instruction required when used at end of unit.
VI.1	The Metric System	Little pre-instruction required.
VI.2	Scientific Notation	Pre-instruction should cover the purpose of scientific notation and the process. Team practice and tournament will provide drill in using scientific notation.

Appendix

TGT Physical Science Learning Objectives

TGT Physical Science Objectives

The TGT Physical Science curriculum materials consist of forty-two sets of worksheets and gamesheets that cover specific learning objectives. These objectives are classified under six basic units: Chemistry; Work, Force, and Motion; Light and Sound; Heat Energy; Electricity, and Measurement.

I. Chemistry
  - I.1 - Laboratory Equipment
    Students will identify equipment used in physical science experiments.
  - I.2 - Physical and Chemical Change
    - a. Students will identify a given change as a physical or chemical change.
    - b. Students will distinguish examples of either a physical or chemical change from among other given examples of changes.
  - I.3 - Solutions and Suspensions
    - a. The student will classify familiar mixtures as solutions or suspensions.
    - b. The student will identify the basic properties of a solution and a suspension.
  - I.4 - Element Symbols
    Students will identify the names of common elements and their symbols.
  - I.5 - Acids, Bases and Salts
    Students will classify a chemical substance as an acid, base or salt when given a formula or property of a substance.
  - I.6 - Elements, Compounds and Mixtures
    Students will classify substances as elements, compounds, or mixtures.
  - I.7 - Common Elements, Radicals and Compounds
    - a. Students will identify common elements and radicals by their formulas or symbols.
    - b. Students will classify formulas and symbols as elements, radicals or compounds.
  - I.8 - Atomic Structure
    - I.8.1 - Periodic Table
      Students will determine an element's name, symbol, atomic weight and atomic number using the periodic table.
    - I.8.2 - Atomic Structure
      - a. Students will apply a set of rules and use the periodic table to assist them in computing the number of electrons, protons and neutrons in an atom.
      - b. Students will arrange electrons in the K, L, and M electron shells for the first eighteen elements on the periodic table.
    - I.8.3 - Count the Atoms
      Students will compute the number of atoms in a formula or equation.

I.9 - Properties and Purification of Water

Students will identify the properties of water and demonstrate basic knowledge of the water purification process.

I.10 - Bonding and Valence

a. Students will be able to determine the valence of common chemical elements.

b. Students will classify elements as metals, non-metals, or noble gases according to their valence.

I.11 - Making Chemical Formulas

Students will arrange elements and radicals to produce correct chemical formulas.

I.12 - Identify the Reaction

Students will identify reactions by examining their equations.

I.13 - Organic and Inorganic Formulas

a. Students will construct a simple molecular formula when given the structural formula.

b. Students will identify a given structural formula as being either organic or inorganic.

I.14 - Chemistry Vocabulary Review

Students will define chemistry unit terms.

II. Work, Force and Motion

II.1 - Simple Machines

a. Students will identify practical examples of levers.

b. Students will compute the IMA, AMA, and efficiency of a lever system by applying the formulas.

II.2 - Ideal Mechanical Advantage (IMA)

a. Students will compute the IMA of simple machines.

b. Students will match IMA formulas with the proper machine.

c. Students will identify factors that affect the IMA of a simple machine.

II.3 - Laws and Principles of Motion

Students will be able to apply Newton's laws of motion and Bernoulli's principle to practical events.

II.4 - Density

a. Students will define terms related to density.

b. Students will apply the density formula and find the density of regular and irregular shaped objects.

II.5 - Energy Conversions

Students will identify energy conversions that take place in common energy conversion systems.

II.6 - Work, Force and Motion Vocabulary Review

Students will define the basic vocabulary words used in the Work, Force and Motion unit.

II.7 - Parts of a Car

Students will identify the main parts of the car.

III. Light and Sound

III.1 - Light and Matter Relationships

Students will classify objects according to their relationship with light.

III.2 - Refraction and Reflection
  - a. Students will be able to identify types of mirrors.
  - b. Students will determine the path light will take as it passes through a transparent media.
  - c. Students will determine the path light will take as it is reflected by a mirror.

III.3 - The Eye
  - a. Students will identify the parts of the eye.
  - b. Students will identify the functions of the parts of the eye.
  - c. Students will recognize the differences between nearsightedness and farsightedness.

III.4 - Producing Color
  - a. Students will identify the color systems and their primaries.
  - b. Students will order and identify the colors of the spectrum.
  - c. Students will predict the results of mixing colors and color systems.

III.5 - Light Vocabulary

Students will define words necessary for understanding the nature of light.

III.6 - Waves and the Ear
  - a. Students will distinguish between waves and their parts.
  - b. Students will identify parts of the ear and their function.
  - c. Students will distinguish between frequency and pitch.

III.7 - Sound Vocabulary Review

Students will define the basic words needed to understand the relationship between waves and sound.

IV. Heat Energy

IV.1 - Heat Transfer
  - a. Students will identify and distinguish among the methods of heat transfer.
  - b. Students will define the terms insulator and conductor.
  - c. Students will identify substances that conduct and insulate against heat.

IV.2 - Heat and Temperature
  - a. Students will identify common Celsius and Fahrenheit temperatures.
  - b. Students will convert readings from one temperature scale to the other.
  - c. Students will compute heat energy loss and gain.

IV.3 - Heat Graphs
  - a. Students will be able to interpret latent heat factors from a graph.
  - b. Students will be able to identify latent heat points.

IV.4 - Heat Vocabulary Review

Students will define basic terms used in the study of heat energy.

V. Electricity

V.1 - What Charge and Why?

a. Students will define the terms "negative charge" and "positive charge."

b. Students will determine if an object is negatively or positively charged.

V.2 - Ohm's Law

a. Students will write and apply Ohm's Law.

b. Students will identify the units and symbols used to measure current, resistance, and electromotive force.

V.3 - General Circuits

a. Students will distinguish between a series and a parallel circuit.

b. Students will calculate the voltage and resistance in parallel and series circuits.

c. Students will identify an open or closed circuit.

V.4 - Electrical Symbols

Students will identify electrical symbols.

V.5 - Electronic Circuits

a. Students will identify the parts of a radio circuit.

b. Students will identify the function of each part of a radio circuit.

V.6 - Electricity Vocabulary Review

Students will be able to define words necessary for understanding electrical concepts.

VI. Measurement

VI.1 - The Metric System

a. Students will identify and use the basic units for measuring length, volume, area and mass in the metric system.

b. Students will compute the conversion of units within the metric system.

VI.2 - Scientific Notation

a. Students will express large numbers in a scientific notation form.

b. Students will convert scientific notation to regular numbers.

TGT PHYSICAL SCIENCE

UNIT: Chemistry

WORKSHEET: Laboratory Equipment

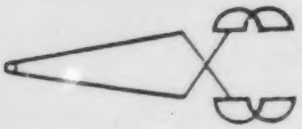
Objective: I.1--Students will identify equipment used in physical science experiments.

Instructions: This worksheet will help you prepare for the Laboratory Equipment Game. Study each diagram carefully. Select the name of the piece of equipment which matches the diagram. The vocabulary list below will not be provided in the tournament.

Vocabulary:

bar magnet
beaker
bell jar
bunsen burner
convection box
evaporating dish
Erlenmeyer flask
Florence flask
funnel
galvanometer
gas collection bottle
glass plate
graduated cylinder
iron ring
medicine dropper
mortar and pestle
platform balance
pneumatic trough
prism
protractor
reagent bottle
ring stand
ring stand clamp
set of masses (weights)
spring balance
test tube brush
test tube clamp
test tube rack
thermometer
tongs
triangular file
tripod
tripod magnifier
voltmeter
watchglass
wire gauze

TGT WORKSHEET: I.1 Laboratory Equipment



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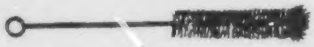

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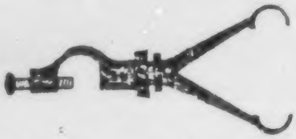

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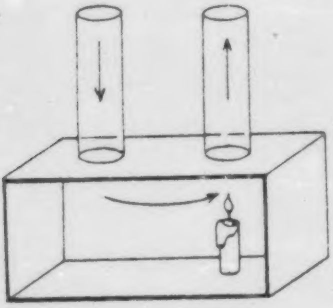

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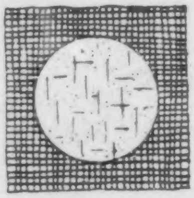

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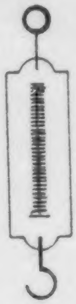

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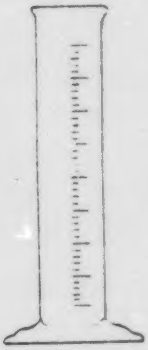

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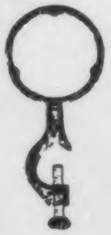

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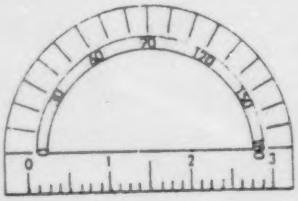

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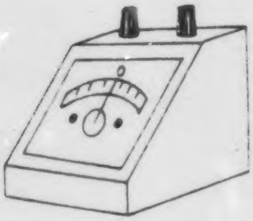

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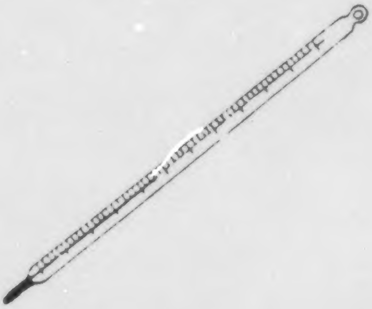

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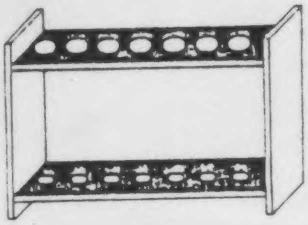

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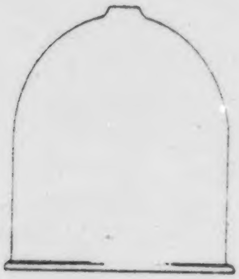

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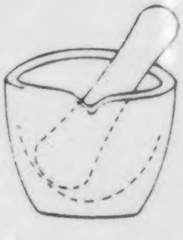

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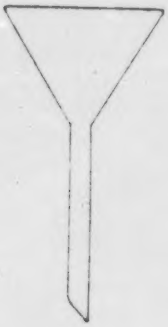

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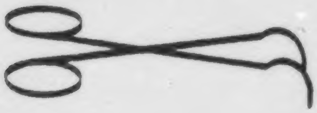

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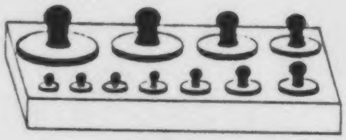

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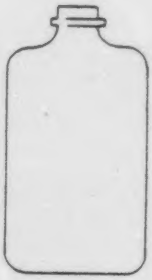

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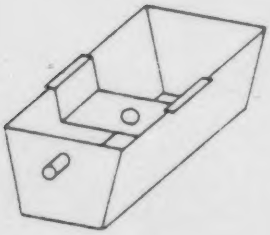

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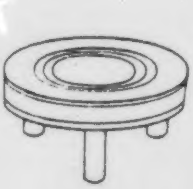

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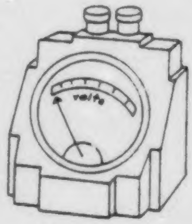

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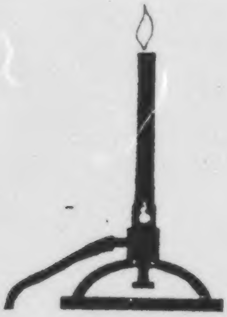

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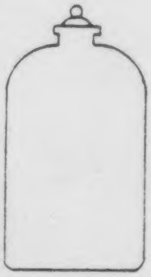

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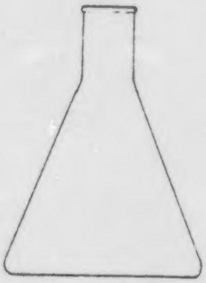

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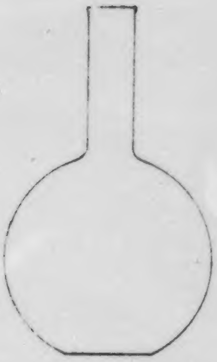

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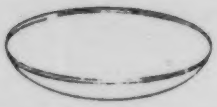

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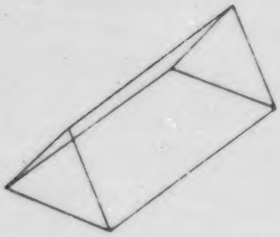

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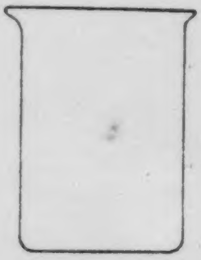

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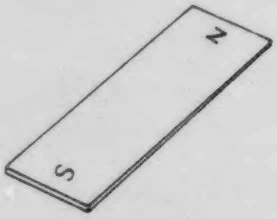

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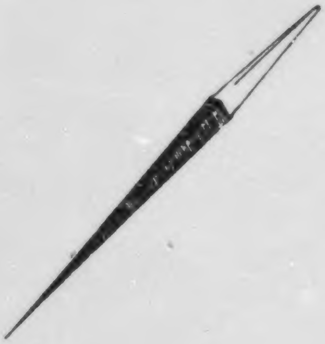

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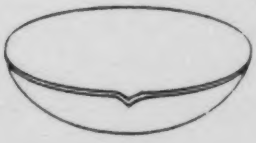

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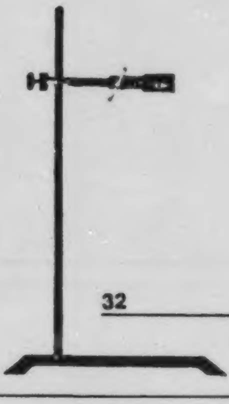

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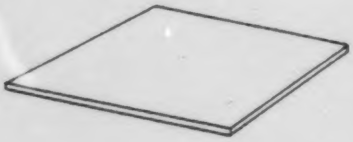

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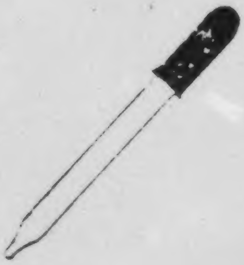

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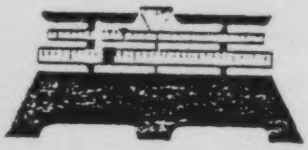

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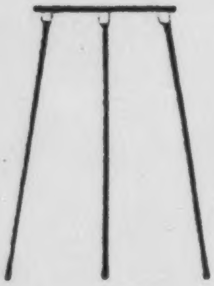


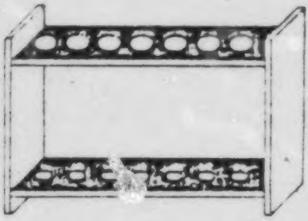
36 ____________________

WORKSHEET ANSWERS

I.1 Laboratory Equipment

1. test tube clamp
2. test tube brush
3. ring stand clamp
4. convection box
5. wire gauze
6. spring balance
7. graduated cylinder
8. iron ring
9. protractor
10. galvanometer
11. thermometer
12. test tube rack
13. bell jar
14. mortar and pestle
15. funnel
16. tongs
17. set of masses (weights)
18. gas collection bottle
19. pneumatic trough
20. tripod magnifier
21. voltmeter
22. bunsen burner
23. reagent bottle
24. Erlenmeyer flask
25. Florence flask
26. watch glass
27. prism
28. beaker
29. bar magnet
30. triangular file
31. evaporating dish
32. ring stand
33. glass plate
34. platform balance
35. tripod
36. medicine dropper

TGT GAMESHEET: I.1 Laboratory Equipment



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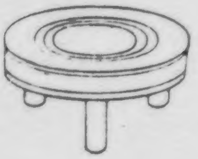

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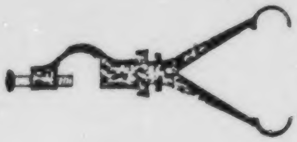

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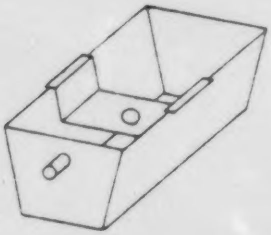

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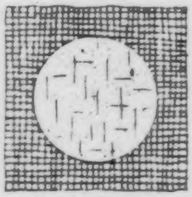

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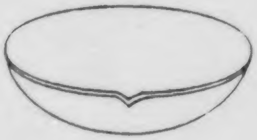

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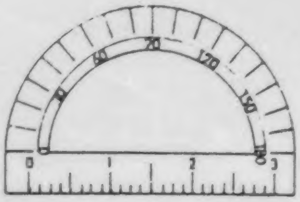
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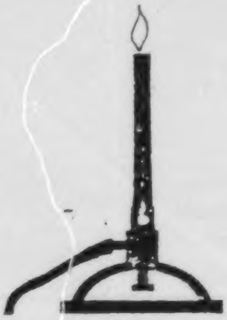

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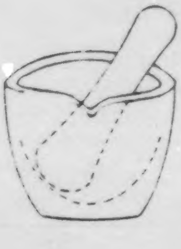

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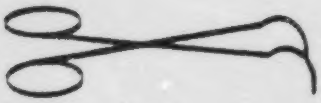

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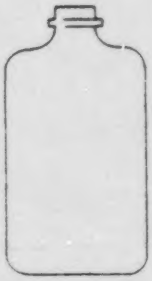

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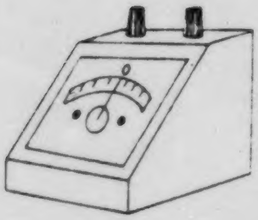

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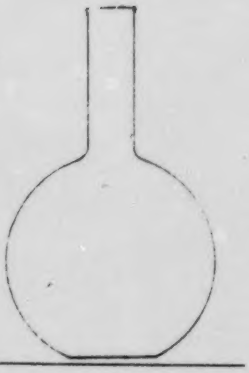

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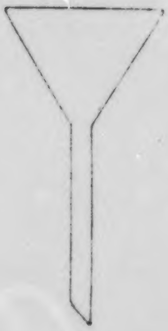

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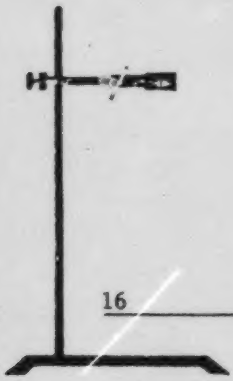

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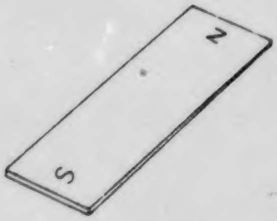

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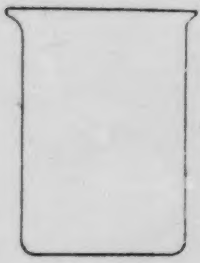

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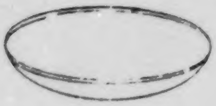

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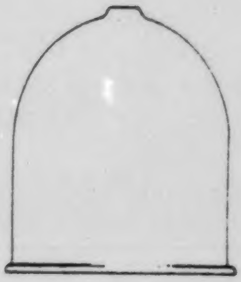

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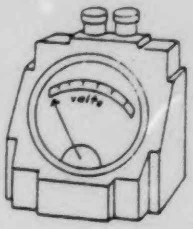

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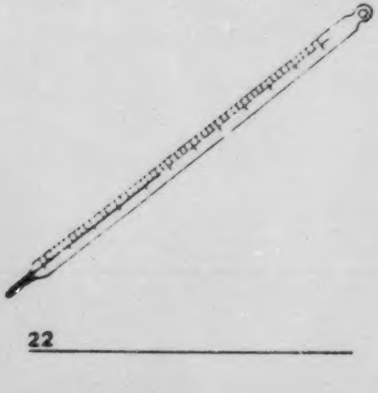

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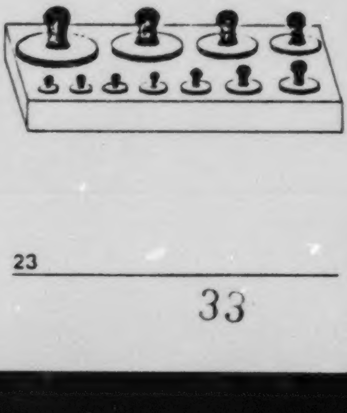

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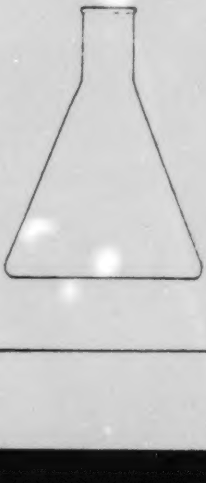

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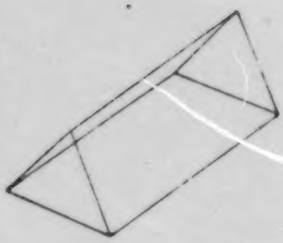

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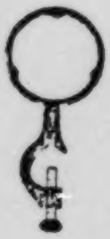

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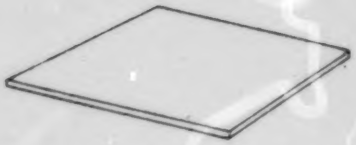

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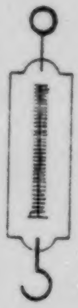

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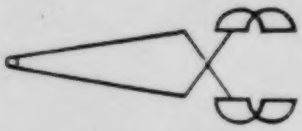

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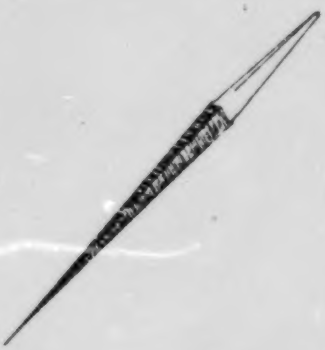

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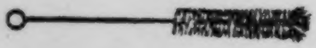

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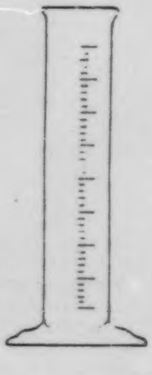

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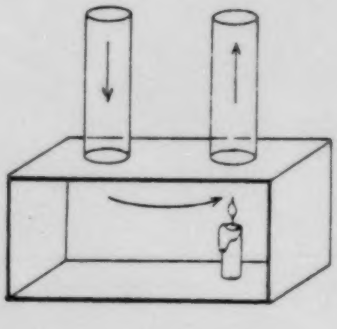

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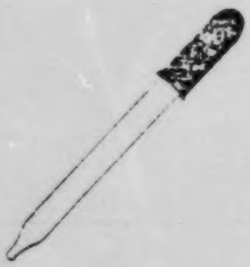

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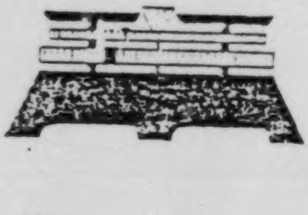

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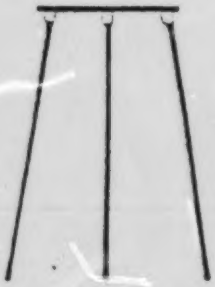


36 ______________________

GAMESHEET ANSWERS

I.1 Laboratory Equipment

1. test tube rack
2. tripod magnifier
3. ring stand clamp
4. pneumatic trough
5. wire gauze
6. evaporating dish
7. reagent bottle
8. protractor
9. bunsen burner
10. mortar and pestle
11. tongs
12. gas collection bottle
13. galvanometer
14. Florence flask
15. funnel
16. ring stand
17. bar magnet
18. beaker
19. watch glass
20. bell jar
21. voltmeter
22. thermometer
23. set of masses (weights)
24. Erlenmeyer flask
25. prism
26. iron ring
27. glass plate
28. spring balance
29. test tube clamp
30. triangular file
31. test tube brush
32. graduated cylinder
33. convection box
34. medicine dropper
35. platform balance
36. tripod

TGT PHYSICAL SCIENCE
UNIT: Chemistry
WORKSHEET: Physical and Chemical Change

Objective: I.2--a. Students will identify a given change as a physical or chemical change.

b. Students will distinguish examples of either a physical or chemical change from among other given examples of changes.

Instructions: This worksheet will help you prepare for the Physical and Chemical Change Game. In items 1-15 decide whether the given example is a physical or chemical change. In items 16-30, choose the change which is different from the others listed and identify it as a physical or chemical change.

Vocabulary:

chemical change
physical change

TGT WORKSHEET: I.2 Physical and Chemical Change

Making tea physical change chemical change 1	An apple decaying physical change chemical change 2	Frosting a cake physical change chemical change 3
Salt dissolving in water physical change chemical change 4	Iron rusting physical change chemical change 5	Soda going flat physical change chemical change 6
Digesting food physical change chemical change 7	Shredding paper physical change chemical change 8	Adding food coloring to water physical change chemical change 9
Using a liquid drain cleaner to open clogged drain physical change chemical change 10	Water evaporating physical change chemical change 11	Milk Souring physical change chemical change 12
Baking a cake physical change chemical change 13	Making ice cubes physical change chemical change 14	Producing cheese physical change chemical change 15

TGT WORKSHEET: I.2 Physical and Chemical Change

a. scrambling an egg
b. coloring in a book
c. painting a chair
d. burning a piece of paper

__ ____________________

16

a. water freezing
b. milk souring
c. plowing the earth
d. clouds forming

__ ____________________

17

a. breaking water into its elements
b. breaking a balloon
c. making vinegar
d. making salt

__ ____________________

18

a. iron rusting
b. soda going flat
c. water evaporating
d. iron bending

__ ____________________

19

a. burning coal
b. lighting a match
c. sanding wood
d. baking a cake

__ ____________________

20

a. making soap
b. a log decaying
c. making vinegar
d. making tea

__ ____________________

21

a. slicing an apple
b. making apple juice
c. making apple cider
d. peeling an apple

__ ____________________

22

a. ice melting
b. cake baking
c. milk souring
d. food digesting

__ ____________________

23

a. tossing a salad
b. freezing water
c. crushing a cigar
d. lighting a cigar

__ ____________________

24

a. making wine
b. making chocolate milk
c. crushing grapes
d. melting glass

__ ____________________

25

a. burning a match
b. cutting grass
c. making beer
d. iron rusting

__ ____________________

26

a. parking a car
b. chopping wood
c. grinding beef
d. producing cheese

__ ____________________

27

a. sanding a floor
b. starting a gasoline engine
c. slicing a tomato
d. filtering water

__ ____________________

28

a. a charcoal fire
b. developing film
c. a log burning
d. putting sugar in tea

__ ____________________

29

a. water evaporating
b. cake baking
c. food digesting
d. oil burning

__ ____________________

30

WORKSHEET ANSWERS

I.2 Physical and Chemical Change

1. physical change
2. chemical change
3. physical change
4. physical change
5. chemical change
6. physical change
7. chemical change
8. physical change
9. physical change
10. chemical change
11. physical change
12. chemical change
13. chemical change
14. physical change
15. chemical change
16. (d) chemical change
17. (b) chemical change
18. (b) physical change
19. (a) chemical change
20. (c) physical change
21. (d) physical change
22. (c) chemical change
23. (a) physical change
24. (d) chemical change
25. (a) chemical change
26. (b) physical change
27. (d) chemical change
28. (b) chemical change
29. (d) physical change
30. (a) physical change

TGT GAMESHEET: I.2 Physical and Chemical Change

Making apple cider physical change chemical change 1	Lighting a cigar physical change chemical change 2	Sanding wood physical change chemical change 3
Making tea physical change chemical change 4	An apple decaying physical change chemical change 5	Frosting a cake physical change chemical change 6
Salt dissolving in water physical change chemical change 7	Iron rusting physical change chemical change 8	Boiling water physical change chemical change 9
Match burning physical change chemical change 10	Making paper physical change chemical change 11	Aerating an aquarium physical change chemical change 12
Making soap physical change chemical change 13	Soda going flat physical change chemical change 14	Shredding paper physical change chemical change 15
Digesting food physical change chemical change 16	Breaking a balloon physical change chemical change 17	Adding food coloring to water physical change chemical change 18
Using a drain cleaner (liquid) physical change chemical change 19	Water evaporating physical change chemical change 20	Casting lead soldiers physical change chemical change 21
Milk souring physical change chemical change 22	Baking a cake physical change chemical change 23	Making ice cubes physical change chemical change 24
Grinding beef physical change chemical change 25	Producing a cheese physical change chemical change 26	A log decaying physical change chemical change 27
Homogenizing milk physical change chemical change 28	Making vinegar physical change chemical change 29	Melting butter physical change chemical change 30

GAMESHEET ANSWERS

I.2 Physical and Chemical Change

1. chemical change
2. chemical change
3. physical change
4. physical change
5. chemical change
6. physical change
7. physical change
8. chemical change
9. physical change
10. chemical change
11. chemical change
12. physical change
13. chemical change
14. physical change
15. physical change
16. chemical change
17. physical change
18. physical change
19. chemical change
20. physical change
21. physical change
22. chemical change
23. chemical change
24. physical change
25. physical change
26. chemical change
27. chemical change
28. chemical change
29. chemical change
30. physical change

TGT PHYSICAL SCIENCE

UNIT: Chemistry

WORKSHEET: Solutions and Suspensions

Objective: I.3--a. The student will classify familiar mixtures as solutions or suspensions.

b. The student will identify the basic properties of a solution and a suspension.

Instructions: This worksheet will help you prepare for the Solutions and Suspensions Game. In each item you will be presented with the name of a substance or a property of a substance. Decide whether the substance is a solution or suspension.

Vocabulary:

dissolve
filtration
mixture
opaque
property
solute
solution
suspension
tincture
transparent

TGT WORKSHEET: I.3 Solutions and Suspensions

Simple syrup is a ________. 1

Smoke is a ________. 2

Oil-based paint is a ________. 3

A cup of tea is a ________. 4

Milk is a ________. 5

Saltwater is a ________. 6

Chocolate milk is a _______. 7

Whipped cream is a ________. 8

Soda pop is a ________. 9

Blood is a ________. 10

Tincture of iodine is a ________. 11

Solder is a ________. 12

A mixture whose components can be separated by filtration is a ________. 13

A mixture whose particles will not settle out is a ________. 14

Orange juice is a ________. 15

Muddy water is a ________. 16

Sugar water is a ________. 17

Hydrogen peroxide is a ________. 18

A mixture whose components cannot be separated by filtration is a ________. 19

A mixture that is cloudy or opaque in appearance is a ________. 20

Lemonade is a ________. 21

Vinegar is a ________. 22

Smog is a ________. 23

Household ammonia is a ________. 24

Gravy is a ________. 25

Kool-Aid is a ________. 26

Italian salad dressing is a ________. 27

Calamine lotion is a ________. 28

Regular gasoline is a ______. 29

Milk of magnesia is a ________. 30

WORKSHEET ANSWERS

I.3 Solutions and Suspensions

1. solution
2. suspension
3. suspension
4. solution
5. suspension
6. solution
7. suspension
8. suspension
9. solution
10. suspension
11. solution
12. solution
13. suspension
14. solution
15. suspension
16. suspension
17. solution
18. solution
19. solution
20. suspension
21. suspension
22. solution
23. suspension
24. solution
25. suspension
26. solution
27. suspension
28. suspension
29. solution
30. suspension

TGT GAMESHEET: I.3 Solutions and Suspensions

Simple syrup is a ________. 1	Tincture of iodine is a ________. 2	Lemonade is a ________. 3
Smoke is a ________. 4	Solder is a ________. 5	Vinegar is a ________. 6
Oil-based paint is a ________. 7	A mixture whose components can be separated by filtration is a ________. 8	Smog is a ________. 9
A cup of tea is a ________. 10	A mixture in which particles will not settle out is a ________. 11	Household ammonia is a ________. 12
Milk is a ________. 13	Orange juice is a ________. 14	Gravy is a ________. 15
Saltwater is a ________. 16	Muddy water is a ________. 17	Kool-Aid is a ________. 18
Chocolate milk is a ______. 19	Sugar water is a ________. 20	Italian salad dressing is a ________. 21
Whipped cream is a _______. 22	Hydrogen peroxide is a ________. 23	Calamine lotion is a ________. 24
Soda pop is a ________. 25	A mixture whose components cannot be separated by filtration is a ________. 26	Regular gasoline is a ________. 27
Blood is a ________. 28	A mixture that is cloudy or opaque in appearance is a ________. 29	Milk of magnesia is a ________. 30

GAMESHEET ANSWERS

I.3 Solutions and Suspensions

1. solution
2. solution
3. suspension
4. suspension
5. solution
6. solution
7. suspension
8. suspension
9. suspension
10. solution
11. solution
12. solution
13. suspension
14. suspension
15. suspension
16. solution
17. suspension
18. solution
19. suspension
20. solution
21. suspension
22. suspension
23. suspension
24. suspension
25. suspension
26. solution
27. solution
28. suspension
29. suspension
30. suspension

TGT PHYSICAL SCIENCE

UNIT: Chemistry
WORKSHEET: Element Symbols

Objective: I.4--Students will identify the names of common elements and their symbols.

Instructions: This worksheet will help you prepare for the Element Symbol Game. If an item presents an element symbol, you state the name of the element. If an item presents an element name, you state the symbol for that element.

Vocabulary:

- aluminum (Al)
- calcium (Ca)
- carbon (C)
- chlorine (Cl)
- copper (Cu)
- fluorine (F)
- gold (Au)
- helium (He)
- hydrogen (H)
- iodine (I)
- iron (Fe)
- lead (Pb)
- magnesium (Mg)
- manganese (Mn)
- mercury (Hg)
- nitrogen (N)
- neon (Ne)
- oxygen (O)
- potassium (K)
- silicon (Si)
- silver (Ag)
- sodium (Na)
- sulfur (S)
- tin (Sn)

TGT WORKSHEET: I.4 Element Symbols

calcium 1	Au 2	oxygen 3
Hg 4	chlorine 5	Al 6
sulfur 7	Sn 8	helium 9
Ag 10	Na 11	iodine 12
Fe 13	lead 14	C 15
nitrogen 16	silicon 17	Cl 18
potassium 19	Cu 20	neon 21
iron 22	H 23	gold 24
Ca 25	fluorine 26	He 27
mercury 28	Mg 29	copper 30

TGT WORKSHEET: I.4 Element Symbols

S 31	silver 32	Pb 33
K 34	sodium 35	tin 36
hydrogen 37	Si 38	O 39
carbon 40	Ne 41	manganese 42
aluminum 43	N 44	Mn 45
F 46	magnesium 47	I 48

WORKSHEET ANSWERS

I.4 Element Symbols

1. Ca
2. gold
3. O
4. mercury
5. Cl
6. aluminum
7. S
8. tin
9. He
10. silver
11. sodium
12. I
13. iron
14. Pb
15. carbon
16. N
17. Si
18. chlorine
19. K
20. copper
21. Ne
22. Fe
23. hydrogen
24. Au
25. calcium
26. F
27. helium
28. Hg
29. magnesium
30. Cu
31. sulfur
32. Ag
33. lead
34. potassium
35. Na
36. Sn
37. H
38. silicon
39. oxygen
40. C
41. neon
42. Mn
43. Al
44. nitrogen
45. manganese
46. fluorine
47. Mg
48. iodine

TGT GAMESHEET: I.4 Element Symbols

calcium 1	Na 2	neon 3
Au 4	iodine 5	copper 6
oxygen 7	Fe 8	H 9
Hg 10	lead 11	gold 12
chlorine 13	C 14	Ca 15
Al 16	nitrogen 17	fluorine 18
sulfur 19	silicon 20	He 21
Sn 22	Cl 23	mercury 24
helium 25	potassium 26	Mg 27
Ag 28	Cu 29	iron 30

GAMESHEET ANSWERS

I.4 Element Symbols

1. Ca
2. sodium
3. Ne
4. gold
5. I
6. Cu
7. O
8. iron
9. hydrogen
10. mercury
11. Pb
12. Au
13. Cl
14. carbon
15. calcium
16. aluminum
17. N
18. F
19. S
20. Si
21. helium
22. tin
23. chlorine
24. Hg
25. He
26. K
27. magnesium
28. silver
29. copper
30. Fe

TGT PHYSICAL SCIENCE

UNIT: Chemistry

WORKSHEET: Acids, Bases and Salts

Objective: I.5--Students will classify a chemical substance as an acid, base or salt when given a formula or property of a substance.

Instructions: This worksheet will help you prepare for the Acids, Bases and Salts Game. In each block you will find a property or formula. Identify each item as an acid, base, salt or none of the above.

Vocabulary:

acid
base
halogen
indicator
ion
neutralization
pH
radical
salt

TGT WORKSHEET: I.5 Acids, Bases and Salts

KOH

a. acid
b. base
c. salt
d. none of the above

1

KI

a. acid
b. base
c. salt
d. none of the above

2

A chemical substance produced in a neutralization reaction along with water.

a. acid
b. base
c. salt
d. none of the above

3

HCl

a. acid
b. base
c. salt
d. none of the above

4

$Fe(OH)_3$

a. acid
b. base
c. salt
d. none of the above

5

HF

a. acid
b. base
c. salt
d. none of the above

6

$NaCl$

a. acid
b. base
c. salt
d. none of the above

7

CCl_4

a. acid
b. base
c. salt
d. none of the above

8

NaF

a. acid
b. base
c. salt
d. none of the above

9

Has a pH above 7

a. acid
b. base
c. salt
d. none of the above

10

NH_4OH

a. acid
b. base
c. salt
d. none of the above

11

H_3PO_4

a. acid
b. base
c. salt
d. none of the above

12

HNO_3

a. acid
b. base
c. salt
d. none of the above

13

$Al(OH)_3$

a. acid
b. base
c. salt
d. none of the above

14

FeS

a. acid
b. base
c. salt
d. none of the above

15

TGT WORKSHEET: I.5 Acids, Bases and Salts

$CuCl_2$

a. acid
b. base
c. salt
d. none of the above

16

Forms hydroxide ions when dissolved in water

a. acid
b. base
c. salt
d. none of the above

17

H_2SO_4

a. acid
b. base
c. salt
d. none of the above

18

$Mg(OH)_2$

a. acid
b. base
c. salt
d. none of the above

19

H_3PO_4

a. acid
b. base
c. salt
d. none of the above

20

CO_2

a. acid
b. base
c. salt
d. none of the above

21

KBr

a. acid
b. base
c. salt
d. none of the above

22

$CuSO_4$

a. acid
b. base
c. salt
d. none of the above

23

Has a bitter taste

a. acid
b. base
c. salt
d. none of the above

24

NaOH

a. acid
b. base
c. salt
d. none of the above

25

Has a sour taste

a. acid
b. base
c. salt
d. none of the above

26

$Ca(OH)_2$

a. acid
b. base
c. salt
d. none of the above

27

$BaCl_2$

a. acid
b. base
c. salt
d. none of the above

28

Changes the color of litmus from red to blue

a. acid
b. base
c. salt
d. none of the above

29

Reacts with active metals

a. acid
b. base
c. salt
d. none of the above

30

TGT WORKSHEET: I.5 Acids, Bases and Salts

H_2O

a. acid
b. base
c. salt
d. none of the above

31

Has a pH below 7

a. acid
b. base
c. salt
d. none of the above

32

$NaNO_3$

a. acid
b. base
c. salt
d. none of the above

33

Changes the color of litmus from blue to red

a. acid
b. base
c. salt
d. none of the above

34

WORKSHEET ANSWERS

I.5 Acids, Bases and Salts

1. (b) base
2. (c) salt
3. (c) salt
4. (a) acid
5. (b) base
6. (a) acid
7. (c) salt
8. (d) none of the above
9. (c) salt
10. (b) base
11. (b) base
12. (a) acid
13. (a) acid
14. (b) base
15. (d) none of the above
16. (c) salt
17. (b) base
18. (a) acid
19. (b) base
20. (a) acid
21. (d) none of the above
22. (c) salt
23. (c) salt
24. (b) base
25. (b) base
26. (a) acid
27. (b) base
28. (c) salt
29. (b) base
30. (a) acid
31. (d) none of the above
32. (a) acid
33. (c) salt
34. (a) acid

TGT GAMESHEET: I.5 Acids, Bases and Salts

Changes the color of litmus from blue to red

a. acid
b. base
c. salt
d. none of the above

1

KOH

a. acid
b. base
c. salt
d. none of the above

2

NH_4OH

a. acid
b. base
c. salt
d. none of the above

3

CO_2

a. acid
b. base
c. salt
d. none of the above

4

KI

a. acid
b. base
c. salt
d. none of the above

5

H_3PO_4

a. acid
b. base
c. salt
d. none of the above

6

KBr

a. acid
b. base
c. salt
d. none of the above

7

A chemical substance produced in a neutralization reaction alone with water

a. acid
b. base
c. salt
d. none of the above

8

HNO_3

a. acid
b. base
c. salt
d. none of the above

9

$CuSO_4$

a. acid
b. base
c. salt
d. none of the above

10

HCl

a. acid
b. base
c. salt
d. none of the above

11

$Al(OH)_3$

a. acid
b. base
c. salt
d. none of the above

12

Has a bitter taste

a. acid
b. base
c. salt
d. none of the above

13

H_2O

a. acid
b. base
c. salt
d. none of the above

14

FeS

a. acid
b. base
c. salt
d. none of the above

15

TGT GAMESHEET: I.5 Acids, Bases and Salts

$NaOH$

a. acid
b. base
c. salt
d. none of the above

16

HF

a. acid
b. base
c. salt
d. none of the above

17

$CuCl_2$

a. acid
b. base
c. salt
d. none of the above

18

Has a sour taste

a. acid
b. base
c. salt
d. none of the above

19

$NaCl$

a. acid
b. base
c. salt
d. none of the above

20

Forms hydroxide ions when dissolved in water

a. acid
b. base
c. salt
d. none of the above

21

$Ca(OH)_2$

a. acid
b. base
c. salt
d. none of the above

22

CCl_4

a. acid
b. base
c. salt
d. none of the above

23

H_2SO_4

a. acid
b. base
c. salt
d. none of the above

24

$BaCl_2$

a. acid
b. base
c. salt
d. none of the above

25

NaF

a. acid
b. base
c. salt
d. none of the above

26

$Mg(OH)_2$

a. acid
b. base
c. salt
d. none of the above

27

Changes the color of litmus from red to blue

a. acid
b. base
c. salt
d. none of the above

28

Has a pH above 7

a. acid
b. base
c. salt
d. none of the above

29

H_3PO_4

a. acid
b. base
c. salt
d. none of the above

30

GAMESHEET ANSWERS

I.5 Acids, Bases and Salts

1. (a) acid
2. (b) base
3. (b) base
4. (d) none of the above
5. (c) salt
6. (a) acid
7. (c) salt
8. (c) salt
9. (a) acid
10. (c) salt
11. (a) acid
12. (b) base
13. (b) base
14. (d) none of the above
15. (d) none of the above
16. (b) base
17. (a) acid
18. (c) salt
19. (a) acid
20. (c) salt
21. (b) base
22. (b) base
23. (d) none of the above
24. (a) acid
25. (c) salt
26. (c) salt
27. (b) base
28. (b) base
29. (b) base
30. (a) acid

TGT PHYSICAL SCIENCE

UNIT: Chemistry

WORKSHEET: Elements, Compounds and Mixtures

Objective: I.6--Students will classify substances as elements, compounds, or mixtures.

Instructions: This worksheet will help you prepare for the Elements, Compounds and Mixtures Game. Classify each substance given as an element, compound or mixture.

Vocabulary:

element
compound
mixture

TGT WORKSHEET: I.6 Elements, Compounds and Mixtures

Saltwater is a(n) _______. element compound mixture 1	Marble is a(n) _______. element compound mixture 2	Paint is a(n) _______. element compound mixture 3
Silver is a(n) _______. element compound mixture 4	Rust is a(n) _______. element compound mixture 5	Tin is a(n) _______. element compound mixture 6
Air is a(n) _______. element compound mixture 7	Chlorine is a(n) _______. element compound mixture 8	Mercury is a(n) _______. element compound mixture 9
Salt is a(n) _______. element compound mixture 10	Iron is a(n) _______. element compound mixture 11	Tapwater is a(n) _______. element compound mixture 12
Oxygen is a(n) _______. element compound mixture 13	Baking soda is a(n) _______. element compound mixture 14	Helium is a(n) _______. element compound mixture 15
Lye is a(n) _______. element compound mixture 16	Ink is a(n) _______. element compound mixture 17	Iodine is a(n) _______. element compound mixture 18
Lead is a(n) _______. element compound mixture 19	Soup is a(n) _______. element compound mixture 20	Neon is a(n) _______. element compound mixture 21
Gunpowder is a(n) _______. element compound mixture 22	Gold is a(n) _______. element compound mixture 23	Distilled water is a(n) _____. element compound mixture 24
Sugar is a(n) _______. element compound mixture 25	Salad is a(n) _______. element compound mixture 26	Alcohol is a(n) _______. element compound mixture 27
Colored glass is a(n) ____. element compound mixture 28	Calcium is a(n) _______. element compound mixture 29	Milk is a(n) _______. element compound mixture 30

WORKSHEET ANSWERS

I.6 Elements, Compounds and Mixtures

1. mixture
2. mixture
3. mixture
4. element
5. compound
6. element
7. mixture
8. element
9. element
10. compound
11. element
12. mixture
13. element
14. compound
15. element
16. compound
17. mixture
18. element
19. element
20. mixture
21. element
22. mixture
23. element
24. compound
25. compound
26. mixture
27. compound
28. mixture
29. element
30. mixture

TGT GAMESHEET: I.6 Elements, Compounds and Mixtures

Carbon dioxide is a(n) ___. element compound mixture 1	Saltwater is a(n) _______. element compound mixture 2	Iron is a(n) _______. element compound mixture 3
Sulfur is a(n) _______. element compound mixture 4	Neon is a(n) _______. element compound mixture 5	Marble is a(n) _______. element compound mixture 6
Tapwater is a(n) _______. element compound mixture 7	Gunpowder is a(n) _______. element compound mixture 8	Paint is a(n) _______. element compound mixture 9
Oxygen is a(n) _______. element compound mixture 10	Gold is a(n) _______. element compound mixture 11	Silver is a(n) _______. element compound mixture 12
Baking soda is a(n) _____. element compound mixture 13	Distilled water is a(n) _____. element compound mixture 14	Rust is a(n) _______. element compound mixture 15
Helium is a(n) _______. element compound mixture 16	Sugar is a(n) _______. element compound mixture 17	Tin is a(n) _______. element compound mixture 18
Lye is a(n) _______. element compound mixture 19	Salad is a(n) _______. element compound mixture 20	Air is a(n) _______. element compound mixture 21
Ink is a(n) _______. element compound mixture 22	Alcohol is a(n) _______. element compound mixture 23	Chlorine is a(n) _______. element compound mixture 24
Iodine is a(n) _______. element compound mixture 25	Colored glass is a(n) _____. element compound mixture 26	Mercury is a(n) _______. element compound mixture 27
Soil is a(n) _______. element compound mixture 28	Calcium is a(n) _______. element compound mixture 29	Salt is a(n) _______. element compound mixture 30

GAMESHEET ANSWERS

I.6 Elements, Compounds and Mixtures

1. compound
2. mixture
3. element
4. element
5. element
6. mixture
7. mixture
8. mixture
9. mixture
10. element
11. element
12. element
13. compound
14. compound
15. compound
16. element
17. compound
18. element
19. compound
20. mixture
21. mixture
22. mixture
23. compound
24. element
25. element
26. mixture
27. element
28. mixture
29. element
30. compound

TGT PHYSICAL SCIENCE

UNIT: Chemistry

WORKSHEET: Common Elements, Radicals and Compounds

Objective: I.7--a. Students will identify common elements and radicals by their formulas or symbols.

b. Students will classify formulas and symbols as elements, radicals or compounds.

Instructions: This worksheet will help you prepare for the Common Elements, Radicals and Compounds Game. In each item you will be given a symbol of an element or a formula of a compound or radical. You must state whether the symbol or formula is an element, radical or compound. If it is a radical, you must name the radical.

Vocabulary:

compound
element
formula
radical
symbol

TGT WORKSHEET: I.7 Common Elements, Radicals and Compounds 41.

OH element compound radical: __________ 1	KCl element compound radical: __________ 2	Hg element compound radical: __________ 3
NH_4OH element compound radical: __________ 4	CO_2 element compound radical: __________ 5	Fe element compound radical: __________ 6
SO_4 element compound radical: __________ 7	H_2S element compound radical: __________ 8	NaCl element compound radical: __________ 9
CCl_4 element compound radical: __________ 10	PO_4 element compound radical: __________ 11	ClO_3 element compound radical: __________ 12
Cl_2 element compound radical: __________ 13	Au element compound radical: __________ 14	NH_4 element compound radical: __________ 15

TGT WORKSHEET: I.7 Common Elements, Radicals and Compounds

$CuSO_4$ element compound radical: ________ 16	H_2O element compound radical: ________ 17	Pb element compound radical: ________ 18
CO_3 element compound radical: ________ 19	$AgNO_3$ element compound radical: ________ 20	Al_2O_3 element compound radical: ________ 21
$Ca(HCO_3)_2$ element compound radical: ________ 22	H_2 element compound radical: ________ 23	HCO_3 element compound radical: ________ 24
K element compound radical: ________ 25	NO_3 element compound radical: ________ 26	KI element compound radical: ________ 27
$CaCl_2$ element compound radical: ________ 28	O_2 element compound radical: ________ 29	SO_4 element compound radical: ________ 30

WORKSHEET ANSWERS

I.7 Common Elements, Radicals and Compounds

1. radical: hydroxide
2. compound
3. element
4. compound
5. compound
6. element
7. radical: sulfate
8. compound
9. compound
10. compound
11. radical: phosphate
12. radical: chlorate
13. element
14. element
15. radical: ammonium
16. compound
17. compound
18. element
19. radical: carbonate
20. compound
21. compound
22. compound
23. element
24. radical: bicarbonate
25. element
26. radical: nitrate
27. compound
28. compound
29. element
30. radical: sulfate

TGT GAMESHEET: I.7 Common Elements, Radicals and Compounds

44.

OH element compound radical: ________ 1	PO_4 element compound radical: ________ 2	Al_2O_3 element compound radical: ________ 3
KCl element compound radical: ________ 4	ClO_3 element compound radical: ________ 5	$Ca(HCO_3)_2$ element compound radical: ________ 6
Hg element compound radical: ________ 7	Cl_2 element compound radical: ________ 8	H_2 element compound radical: ________ 9
NH_4OH element compound radical: ________ 10	Au element compound radical: ________ 11	HCO_3 element compound radical: ________ 12
CO_2 element compound radical: ________ 13	NH_4 element compound radical: ________ 14	K element compound radical: ________ 15

TGT GAMESHEET: I.7 Common Elements, Radicals and Compounds

Fe element compound radical: ________ 16	$CuSO_4$ element compound radical: ________ 17	NO_3 element compound radical: ________ 18
SO_3 element compound radical: ________ 19	H_2O element compound radical: ________ 20	KI element compound radical: ________ 21
H_2S element compound radical: ________ 22	Pb element compound radical: ________ 23	$CaCl_2$ element compound radical: ________ 24
NaCl element compound radical: ________ 25	CO_3 element compound radical: ________ 26	O_2 element compound radical: ________ 27
CCl_4 element compound radical: ________ 28	$AgNO_3$ element compound radical: ________ 29	SO_4 element compound radical: ________ 30

GAMESHEET ANSWERS

I.7 Common Elements, Radicals and Compounds

1. radical: hydroxyl
2. radical: phosphate
3. compound
4. compound
5. radical: chlorate
6. compound
7. element
8. element
9. element
10. compound
11. element
12. radical: bicarbonate
13. compound
14. radical: ammonium
15. element
16. element
17. compound
18. radical: nitrate
19. radical: sulfate
20. compound
21. compound
22. compound
23. element
24. compound
25. compound
26. radical: carbonate
27. element
28. compound
29. compound
30. radical: sulfate

TGT PHYSICAL SCIENCE

UNIT: Chemistry

WORKSHEET: Periodic Table

Objective: I.8.1--Students will determine an element's name, symbol, atomic weight and atomic number using the periodic table.

Instructions: This worksheet will help you prepare for the Periodic Table Game. Use the periodic table to supply the missing piece(s) of information in each block

In the tournament you will also need to know the names of elements.

Vocabulary:

atom
atomic number

atomic weight
element

symbol

METALS — NONMETALS — NOBLE GASES

1 ← Atomic Number
H ← Symbol
1 ← Atomic Weight (rounded off)

(Carbon is the Atomic weight standard.)

PERIODIC TABLE OF THE ELEMENTS

1 H 1																	2 He 4
3 Li 7	4 Be 9											5 B 11	6 C 12	7 N 14	8 O 16	9 F 19	10 Ne 20
11 Na 23	12 Mg 24											13 Al 27	14 Si 28	15 P 31	16 S 32	17 Cl 35	18 Ar 40
19 K 39	20 Ca 40	21 Sc 45	22 Ti 48	23 V 51	24 Cr 52	25 Mn 55	26 Fe 56	27 Co 59	28 Ni 59	29 Cu 64	30 Zn 65	31 Ga 70	32 Ge 73	33 As 75	34 Se 79	35 Br 80	36 Kr 84
37 Rb 85	38 Sr 88	39 Y 89	40 Zr 91	41 Nb 93	42 Mo 96	43 Tc 99	44 Ru 101	45 Rh 103	46 Pd 106	47 Ag 108	48 Cd 112	49 In 115	50 Sn 119	51 Sb 122	52 Te 128	53 I 127	54 Xe 131
55 Cs 133	56 Ba 137	*	72 Hf 179	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 Tl 204	82 Pb 207	83 Bi 209	84 Po 210	85 At 210	86 Rn 222
87 Fr 223	88 Ra 226	* *															

*Elements 57-71 comprise a related series called Rare Earths.

**Elements 89-103 make a series which include the Transuranium (man-made) Elements (93-103)

TGT WORKSHEET: I.8.1 Periodic Table

Element - Sodium
Atomic No. - 11
Atomic Wt. - (a)
Symbol - (b)
1

Element - Aluminum
Atomic No. - (a)
Atomic Wt. - 27
Symbol - (b)
2

Element - Helium
Atomic No. - (a)
Atomic Wt. - (b)
Symbol - He
3

Element - Mercury
Atomic No. - (a)
Atomic Wt. - 201
Symbol - (b)
4

Element - Iron
Atomic No. - 26
Atomic Wt. - (a)
Symbol - (b)
5

Element - Sulfur
Atomic No. - (a)
Atomic Wt. - (b)
Symbol - S
6

Element - Carbon
Atomic No. - (a)
Atomic Wt. - 12
Symbol - (b)
7

Element - Silver
Atomic No. - (a)
Atomic Wt. - 108
Symbol - (b)
8

Element - Chlorine
Atomic No. - (a)
Atomic Wt. - (b)
Symbol - Cl
9

Element - Copper
Atomic No. - 29
Atomic Wt. - (a)
Symbol - (b)
10

Element - Oxygen
Atomic No. - (a)
Atomic Wt. - (b)
Symbol - O
11

Element - Silicon
Atomic No. - 14
Atomic Wt. - (a)
Symbol - (b)
12

Element - Lead
Atomic No. - (a)
Atomic Wt. - 207
Symbol - (b)
13

Element - Neon
Atomic No. - (a)
Atomic Wt. - (b)
Symbol - Ne
14

Element - Potassium
Atomic No. - (a)
Atomic Wt. - 39
Symbol - (b)
15

TGT WORKSHEET: I.8.1 Periodic Table

Element - Tin Atomic No. - 50 Atomic Wt. - (a) Symbol - (b) 16	Element - Iodine Atomic No. - (a) Atomic Wt. - 127 Symbol - (b) 17	Element - Nitrogen Atomic No. - (a) Atomic Wt. - (b) Symbol - N 18
Element - Gold Atomic No. - (a) Atomic Wt. - 197 Symbol - (b) 19	Element - Hydrogen Atomic No. - 1 Atomic Wt. - (a) Symbol - (b) 20	Element - Zinc Atomic No. - (a) Atomic Wt. - (b) Symbol - Zn 21
Element - Fluorine Atomic No. - 9 Atomic Wt. - (a) Symbol - (b) 22	Element - Magnesium Atomic No. - (a) Atomic Wt. - 24 Symbol - (b) 23	Element - Phosphorus Atomic No. - (a) Atomic Wt. - (b) Symbol - P 24
Element - Nickel Atomic No. - (a) Atomic Wt. - (b) Symbol - Ni 25	Element - (a) Atomic No. - 8 Atomic Wt. - 16 Symbol - (b) 26	Element - Mercury Atomic No. - 80 Atomic Wt. - (a) Symbol - (b) 27
Element - Copper Atomic No. - (a) Atomic Wt. - 64 Symbol - (b) 28	Element - Calcium Atomic No. - (a) Atomic Wt. - (b) Symbol - Ca 29	Element - Iron Atomic No. - (a) Atomic Wt. - 56 Symbol - (b) 30

WORKSHEET ANSWERS

I.8.1 Periodic Table

1. (a) 23
(b) Na

2. (a) 13
(b) Al

3. (a) 2
(b) 4

4. (a) 80
(b) Hg

5. (a) 56
(b) Fe

6. (a) 16
(b) 32

7. (a) 6
(b) C

8. (a) 47
(b) Ag

9. (a) 17
(b) 35

10. (a) 64
(b) Cu

11. (a) 8
(b) 16

12. (a) 28
(b) Si

13. (a) 82
(b) Pb

14. (a) 10
(b) 20

15. (a) 19
(b) K

16. (a) 119
(b) Sn

17. (a) 53
(b) I

18. (a) 7
(b) 14

19. (a) 79
(b) Au

20. (a) 1
(b) H

21. (a) 30
(b) 65

22. (a) 19
(b) F

23. (a) 12
(b) Mg

24. (a) 15
(b) 31

25. (a) 28
(b) 59

26. (a) Oxygen
(b) O

27. (a) 201
(b) Hg

28. (a) 29
(b) Cu

29. (a) 20
(b) 40

30. (a) 26
(b) Fe

For Use with Gamesheet I.8.1

PERIODIC TABLE OF THE ELEMENTS

Atomic Number
Symbol
Atomic Weight (rounded off)

(Carbon is the Atomic weight standard.)

METALS												NONMETALS					NOBLE GASES
1 H 1																	2 He 4
3 Li 7	4 Be 9											5 B 11	6 C 12	7 N 14	8 O 16	9 F 19	10 Ne 20
11 Na 23	12 Mg 24											13 Al 27	14 Si 28	15 P 31	16 S 32	17 Cl 35	18 Ar 40
19 K 39	20 Ca 40	21 Sc 45	22 Ti 48	23 V 51	24 Cr 52	25 Mn 55	26 Fe 56	27 Co 59	28 Ni 59	29 Cu 64	30 Zn 65	31 Ga 70	32 Ge 73	33 As 75	34 Se 79	35 Br 80	36 Kr 84
37 Rb 85	38 Sr 88	39 Y 89	40 Zr 91	41 Nb 93	42 Mo 96	43 Tc 99	44 Ru 101	45 Rh 103	46 Pd 106	47 Ag 108	48 Cd 112	49 In 115	50 Sn 119	51 Sb 122	52 Te 128	53 I 127	54 Xe 131
55 Cs 133	56 Ba 137	*	72 Hf 179	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 Tl 204	82 Pb 207	83 Bi 209	84 Po 210	85 At 210	86 Rn 222
87 Fr 223	88 Ra 226	* *															

*Elements 57-71 comprise a related series called Rare Earths.

**Elements 89-103 make a series which include the Transuranium (man-made) Elements (93-103)

TGT GAMESHEET: I.8.1 Periodic Table

Element - Lead Atomic No. - (a) Atomic Wt. - 207 Symbol - (b) 1	Element - Magnesium Atomic No. - (a) Atomic Wt. - (b) Symbol - Mg 2	Element - Silver Atomic No. - (a) Atomic Wt. - 108 Symbol - (b) 3
Element - (a) Atomic No. - 1 Atomic Wt. - 1 Symbol - (b) 4	Element - Iron Atomic No. - 26 Atomic Wt. - (a) Symbol - (b) 5	Element - Iodine Atomic No. - (a) Atomic Wt. - 127 Symbol - (b) 6
Element - (a) Atomic No. - 29 Atomic Wt. - (b) Symbol - Cu 7	Element - Sodium Atomic No. - 11 Atomic Wt. - (a) Symbol - (b) 8	Element - (a) Atomic No. - (b) Atomic Wt. - 27 Symbol - Al 9
Element - Helium Atomic No. - (a) Atomic Wt. - 4 Symbol - (b) 10	Element - Oxygen Atomic No. - (a) Atomic Wt. - (b) Symbol - O 11	Element - (a) Atomic No. - 6 Atomic Wt. - 12 Symbol - (b) 12
Element - Nickel Atomic No. - (a) Atomic Wt. - (b) Symbol - Ni 13	Element - (a) Atomic No. - 16 Atomic Wt. - (b) Symbol - S 14	Element - Zinc Atomic No. - (a) Atomic Wt. - (b) Symbol - Zn 15

TGT GAMESHEET: I.8.1 Periodic Table

Element - (a) Atomic No. - 17 Atomic Wt. - (b) Symbol - Cl 16	Element - Mercury Atomic No. - (a) Atomic Wt. - 201 Symbol - (b) 17	Element - (a) Atomic No. - 14 Atomic Wt. - (b) Symbol - Si 18
Element - (a) Atomic No. - 10 Atomic Wt. - (b) Symbol - Ne 19	Element - (a) Atomic No. - (b) Atomic Wt. - 19 Symbol - F 20	Element - Potassium Atomic No. - (a) Atomic Wt. - 39 Symbol - (b) 21
Element - (a) Atomic No. - 50 Atomic Wt. - (b) Symbol - Sn 22	Element - (a) Atomic No. - (b) Atomic Wt. - 56 Symbol - Fe 23	Element - (a) Atomic No. - 15 Atomic Wt. - (b) Symbol - P 24
Element - (a) Atomic No. - (b) Atomic Wt. - 201 Symbol - Hg 25	Element - (a) Atomic No. - (b) Atomic Wt. - 16 Symbol - O 26	Element - Calcium Atomic No. - (a) Atomic Wt. - 40 Symbol - (b) 27
Element - (a) Atomic No. - (b) Atomic Wt. - 197 Symbol - Au 28	Element - Copper Atomic No. - (a) Atomic Wt. - 63 Symbol - (b) 29	Element - (a) Atomic No. - 7 Atomic Wt. - 14 Symbol - (b) 30

GAMESHEET ANSWERS

I.8.1 Periodic Table

1. (a) 82
(b) Pb

2. (a) 12
(b) 24

3. (a) 47
(b) Ag

4. (a) Hydrogen
(b) H

5. (a) 56
(b) Fe

6. (a) 53
(b) I

7. (a) Copper
(b) 64

8. (a) 23
(b) Na

9. (a) Aluminum
(b) 13

10. (a) 2
(b) He

11. (a) 8
(b) 16

12. (a) Carbon
(b) C

13. (a) 28
(b) 59

14. (a) Sulfur
(b) 32

15. (a) 30
(b) 65

16. (a) Chlorine
(b) 35

17. (a) 80
(b) Hg

18. (a) Silicon
(b) 28

19. (a) Neon
(b) 20

20. (a) Fluorine
(b) 9

21. (a) 19
(b) K

22. (a) Tin
(b) 119

23. (a) Iron
(b) 26

24. (a) Phosphorus
(b) 31

25. (a) Mercury
(b) 80

26. (a) Oxygen
(b) 8

27. (a) 20
(b) Ca

28. (a) Gold
(b) 79

29. (a) 29
(b) Cu

30. (a) Nitrogen
(b) N

TGT PHYSICAL SCIENCE

UNIT: Chemistry

WORKSHEET: Atomic Structure

Objective: I.8.2--a. Students will apply a set of rules and use the periodic table to assist them in computing the number of electrons, protons and neutrons in an atom.

b. Students will arrange electrons in the K, L, and M electron shells for the first eighteen elements on the periodic table.

Instructions: This worksheet will help you prepare for the Atomic Structure Game. In items 1-12, write the correct number of protons and neutrons in the nucleus. In diagrams 13-30, write in the correct number of protons and neutrons in the nucleus and the correct number of electrons in the K, L, and M shells.

Vocabulary:

atomic number
atomic weight (mass)
electron
energy level
neutron
nucleus
proton
shell

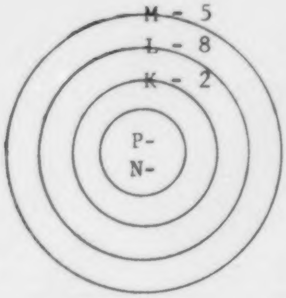
I. General Rules for Atomic Structure:

- A. The number of protons in an atom is equal to the atomic number.
- B. The number of electrons in an atom is equal to the number of protons.
- C. The number of neutrons can be found by subtracting the atomic number from the atomic weight. Use the "rounded off" atomic weight for this calculation.

II. General Rules for Electron Structure:

- A. Electrons are arranged in shells around the nucleus of an atom. The first three shells are called K, L, and M., and are arranged around the nucleus.
- B. To arrange the electrons each shell must be filled in order from K through M.
- C. The maximum number of electrons in each shell when an atom is stable is as follows: K-2, L-8, M-8.

Example: Phosphorus has 15 electrons. They would be arranged like this:



METALS

NONMETALS

NOBLE GASES

1 ← Atomic Number
H ← Symbol
1 ← Atomic Weight (rounded off)

(Carbon is the Atomic weight standard.)

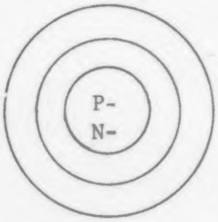
PERIODIC TABLE OF THE ELEMENTS

1 H 1																	2 He 4
3 Li 7	4 Be 9											5 B 11	6 C 12	7 N 14	8 O 16	9 F 19	10 Ne 20
11 Na 23	12 Mg 24											13 Al 27	14 Si 28	15 P 31	16 S 32	17 Cl 35	18 Ar 40
19 K 39	20 Ca 40	21 Sc 45	22 Ti 48	23 V 51	24 Cr 52	25 Mn 55	26 Fe 56	27 Co 59	28 Ni 59	29 Cu 64	30 Zn 65	31 Ga 70	32 Ge 73	33 As 75	34 Se 79	35 Br 80	36 Kr 84
37 Rb 85	38 Sr 88	39 Y 89	40 Zr 91	41 Nb 93	42 Mo 96	43 Tc 99	44 Ru 101	45 Rh 103	46 Pd 106	47 Ag 108	48 Cd 112	49 In 115	50 Sn 119	51 Sb 122	52 Te 128	53 I 127	54 Xe 131
55 Cs 133	56 Ba 137	*	72 Hf 179	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 Tl 204	82 Pb 207	83 Bi 209	84 Po 210	85 At 210	86 Rn 222
87 Fr 223	88 Ra 226	* *															

*Elements 57-71 comprise a related series called Rare Earths.

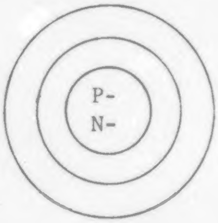
**Elements 89-103 make a series which include the Transuranium (man-made) Elements (93-103)

TGT WORKSHEET: I.8.2 Atomic Structure



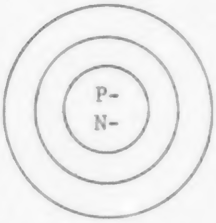
Carbon
C

1



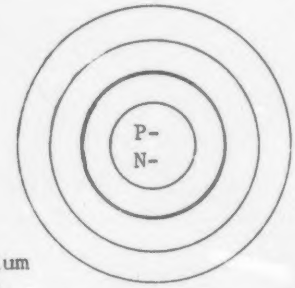
Lithium
Li

2



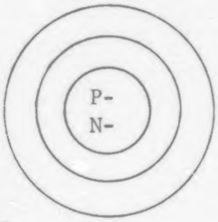
Fluorine
F

3



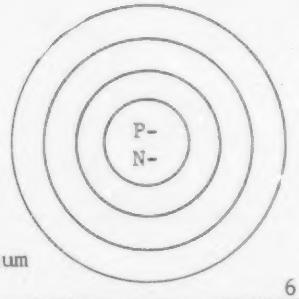
Sodium
Na

4



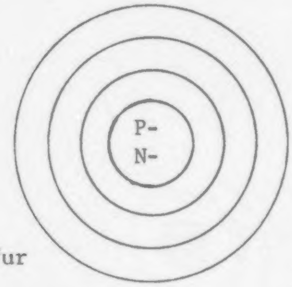
Beryllium
Be

5



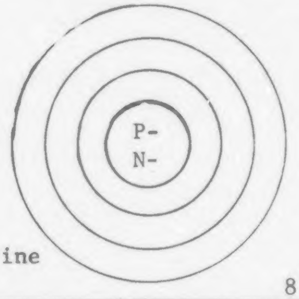
Aluminum
Al

6



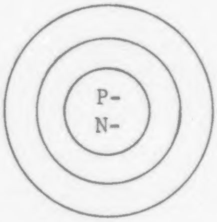
Sulfur
S

7



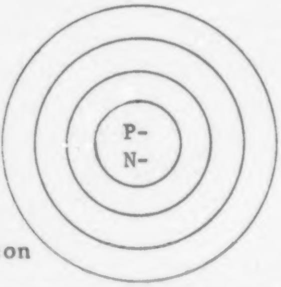
Chlorine
Cl

8



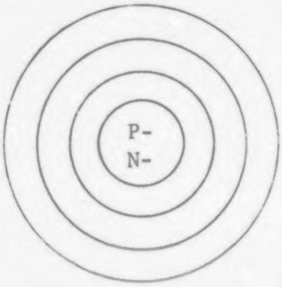
Oxygen
O

9



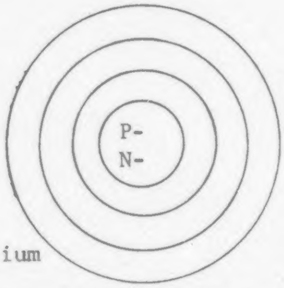
Silicon
Si

10



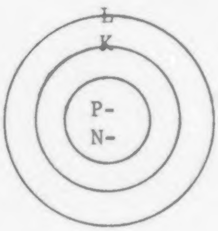
Argon
Ar

11



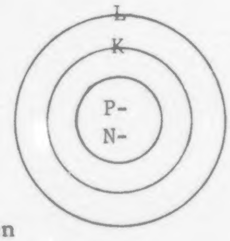
Magnesium
Mg

12



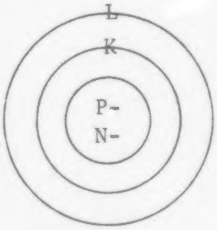
Neon
Ne

13



Nitrogen
N

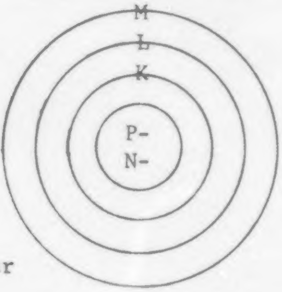
14



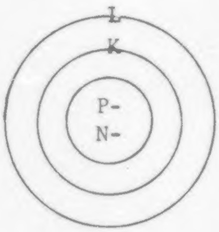
Oxygen
O

15

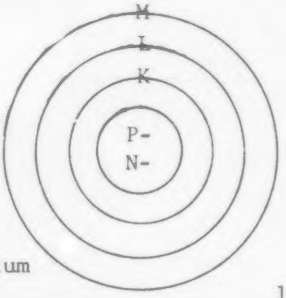
TGT WORKSHEET: I.8.2 Atomic Structure



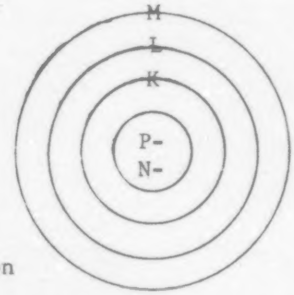
Sulfur
S
16



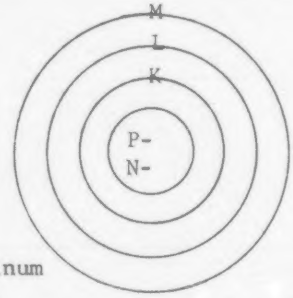
Boron
B
17



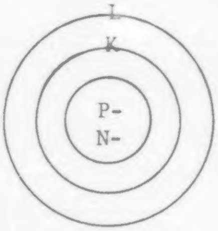
Magnesium
Mg
18



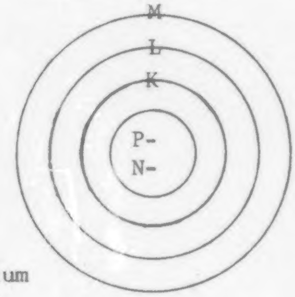
Argon
Ar
19



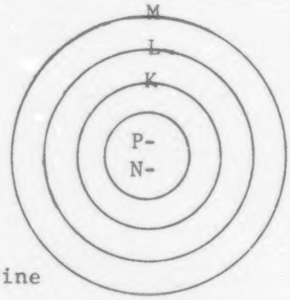
Aluminum
Al
20



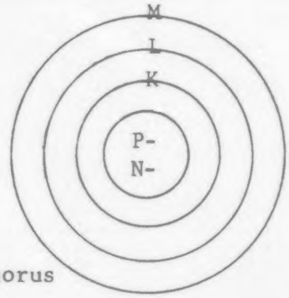
Lithium
Li
21



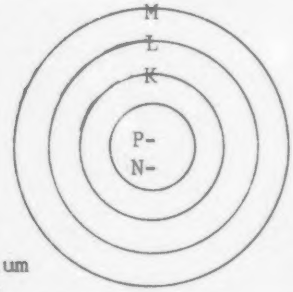
Sodium
Na
22



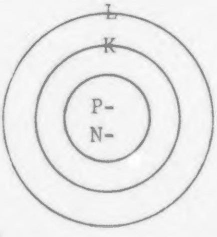
Chlorine
Cl
23



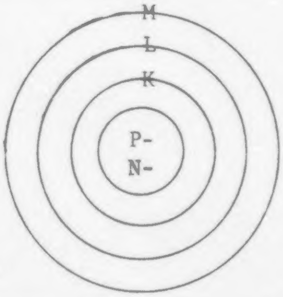
Phosphorus
P
24



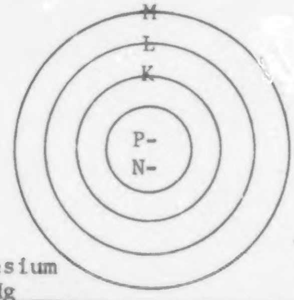
Sodium
Na
25



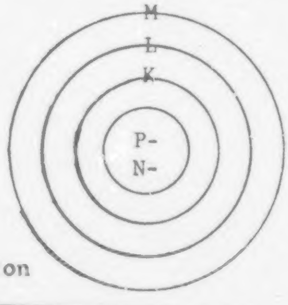
Fluorine
F
26



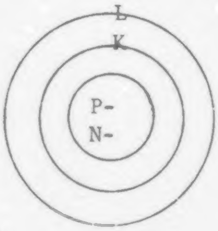
Sulfur
S
27



Magnesium
Mg
28



Silicon
Si
29



Nitrogen
N
30

WORKSHEET ANSWERS

I.8.2 Atomic Structure

1. P-6 N-6
2. P-3 N-4
3. P-9 N-10
4. P-11 N-12
5. P-4 N-5
6. P-13 N-14
7. P-16 N-16
8. P-17 N-18
9. P-8 N-8
10. P-14 N-14
11. P-18 N-22
12. P-12 N-12
13. P-10 N-10 K (2), L (8)
14. P-7 N-7 K (2), L (5)
15. P-8 N-8 K (2), L (6)
16. P-16 N-16 K (2), L (8), M (6)
17. P-5 N-6 K (2), L (3)
18. P-12 N-12 K (2), L (8), M (2)
19. P-18 N-22 K (2), L (8), M (8)
20. P-13 N-14 K (2), L (8), M (3)
21. P-3 N-4 K (2), L (1)
22. P-11 N-12 K (2), L (8), M (1)
23. P-17 N-18 K (2), L (8), M (7)
24. P-15 N-16 K (2), L (8), M (5)
25. P-11 N-12 K (2), L (8), M (1)
26. P-9 N-10 K (2), L (7)
27. P-16 N-16 K (2), L (8), M (6)
28. P-12 N-12 K (2), L (8), M (2)
29. P-14 N-14 K (2), L (8), M (4)
30. P-7 N-7 K (2), L (5)

For Use with Gamesheet I.8.2

METALS

NONMETALS

NOBLE GASES

1 — Atomic Number
H — Symbol
1 — Atomic Weight (rounded off)

(Carbon is the Atomic weight standard)

PERIODIC TABLE OF THE ELEMENTS

1 H 1																	2 He 4
3 Li 7	4 Be 9											5 B 11	6 C 12	7 N 14	8 O 16	9 F 19	10 Ne 20
11 Na 23	12 Mg 24											13 Al 27	14 Si 28	15 P 31	16 S 32	17 Cl 35	18 Ar 40
19 K 39	20 Ca 40	21 Sc 45	22 Ti 48	23 V 51	24 Cr 52	25 Mn 55	26 Fe 56	27 Co 59	28 Ni 59	29 Cu 64	30 Zn 65	31 Ga 70	32 Ge 73	33 As 75	34 Se 79	35 Br 80	36 Kr 84
37 Rb 85	38 Sr 88	39 Y 89	40 Zr 91	41 Nb 93	42 Mo 96	43 Tc 99	44 Ru 101	45 Rh 103	46 Pd 106	47 Ag 108	48 Cd 112	49 In 115	50 Sn 119	51 Sb 122	52 Te 128	53 I 127	54 Xe 131
55 Cs 133	56 Ba 137	*	72 Hf 179	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 Tl 204	82 Pb 207	83 Bi 209	84 Po 210	85 At 210	86 Rn 222
87 Fr 223	88 Ra 226	* *															

*Elements 57-71 comprise a related series called Rare Earths.

**Elements 89-103 make a series which include the Transuranium (man-made) Elements (93-103)

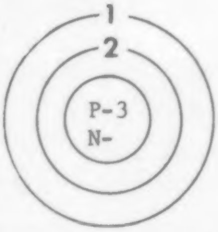
TGT GAMESHEET: I.8.2 Atomic Structure

GAMESHEET INSTRUCTIONS:

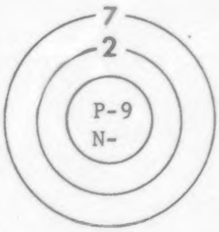
1. In items 1-18, apply the rules for atomic structure using the periodic table to fill in the blank correctly.
2. In items 19-30, supply the missing information to complete the diagram of the atom. Again, apply the rules for atomic structure and use the periodic table.

Iron (Fe) has ___ protons. a) 56 b) 30 c) 26 d) 50 1	Silver (Ag) has ___ neutrons. a) 108 b) 61 c) 47 d) 14 2	Sulfur (S) has ___ protons. a) 32 b) 16 c) 17 d) 48 3
Chlorine (Cl) has ___ electrons. a) 17 b) 18 c) 35 c) 52 4	Potassium (K) has ___ neutrons. a) 19 b) 39 c) 18 d) 20 5	Aluminum (Al) has ___ electrons. a) 2 b) 3 c) 8 d) 5 6
Sodium (Na) has ___ electrons in the M shell. a) 1 b) 11 c) 2 d) 8 7	Iodine (I) has ___ protons. a) 127 b) 53 c) 74 d) 21 8	Aluminum (Al) has ___ neutrons. a) 27 b) 13 c) 40 d) 14 9
An atom of gold (Au) would contain a total of ___ electrons. a) 197 b) 97 c) 79 d) 118 10	An atom of oxygen (O) has ___ electrons in the L shell. a) 8 b) 6 c) 10 d) 2 11	An atom of zinc (Zn) has ___ neutrons. a) 35 b) 30 c) 60 d) 65 12
An atom of phosphorus (P) has ___ electrons in the M shell. a) 15 b) 16 c) 5 d) 31 13	An atom of nitrogen (N) has ___ protons. a) 6 b) 14 c) 20 d) 7 14	An atom of boron (B) has ___ electrons in the L shell. a) 3 b) 2 c) 5 d) 10 15
An atom of tin (Sn) has ___ protons. a) 69 b) 118 c) 50 d) 91 16	An atom of iron (Fe) has a total of ___ electrons. a) 56 b) 26 c) 30 d) 36 17	An atom of copper (Cu) has ___ neutrons. a) 64 b) 6 c) 29 d) 35 18

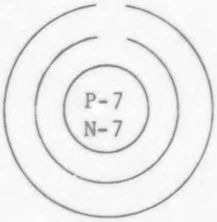
TGT GAMESHEET: I.8.2 Atomic Structure



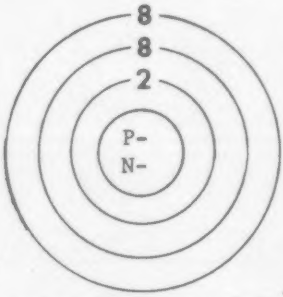
Lithium
Li
19



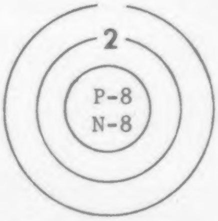
Fluorine
F
20



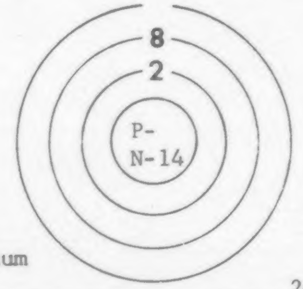
Nitrogen
N
21



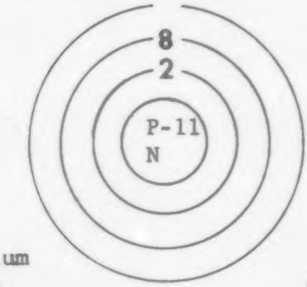
Argon
Ar
22



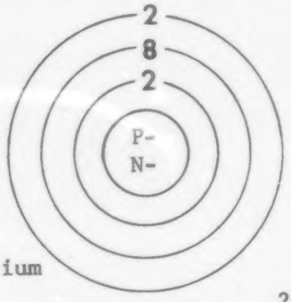
Oxygen
O
23



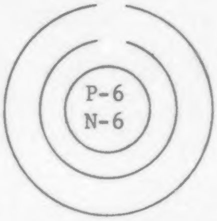
Aluminum
Al
24



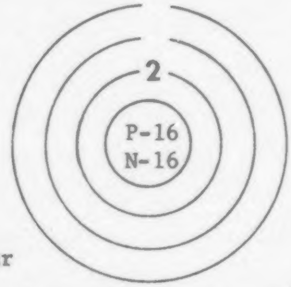
Sodium
Na
25



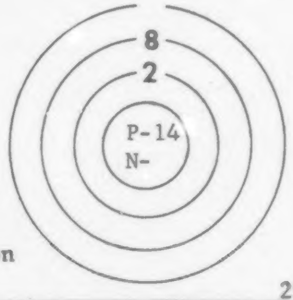
Magnesium
Mg
26



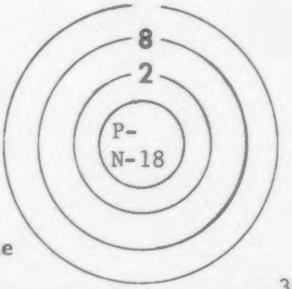
Carbon
C
27



Sulfur
S
28



Silicon
Si
29



Chlorine
Cl
30

GAMESHEET ANSWERS

I.8.2 Atomic Structure

1. c) 26
2. b) 61
3. b) 16
4. a) 17
5. d) 20
6. c) 8
7. a) 1
8. b) 53
9. d) 14
10. c) 79
11. b) 6
12. a) 35
13. c) 5
14. d) 7
15. a) 3
16. c) 50
17. b) 26
18. d) 35
19. N-4
20. N-10
21. K (2), L (5)
22. P-18, N-22
23. L (6)
24. P-13, M (3)
25. N-12, M (1)
26. P-12, N-12
27. K (2), L (4)
28. L (8), M (6)
29. N-14, M (4)
30. P-17, M (7)

TGT PHYSICAL SCIENCE
UNIT: Chemistry
WORKSHEET: Count the Atoms

Objective: I.8.3--Students will compute the number of atoms in a formula or equation.

Instructions: This worksheet will help you prepare for the Count the Atoms Game. In items 1-20, compute the number of atoms in each formula. In numbers 21-30, count the atoms on each side of the equation and determine if they are equal. Write number of atoms in the space under each side of the equation and circle the word equal or unequal to show if the equation is balanced or not.

TGT WORKSHEET: I.8.3 Count the Atoms

Ag_2S ________ 1	KNO_3 ________ 2	$MgSO_4$ ________ 3
$2KCl$ ________ 4	$CuSO_4$ ________ 5	Na_2O ________ 6
$AgNO_3$ ________ 7	$Al_2(SO_4)_3$ ________ 8	$MgCl_2$ ________ 9
NH_4Cl ________ 10	$Ba(OH)_2$ ________ 11	Al_2S_3 ________ 12
$Ba_3(PO_4)_2$ ________ 13	K_2SO_3 ________ 14	$ZnSO_3$ ________ 15
KCl ________ 16	CCl_4 ________ 17	$2Al_2O_3$ ________ 18
$BaCl_2$ ________ 19	$2CuSO_4$ ________ 20	$2HCl + Zn \rightarrow ZnCl_2 + H_2$ ________ ________ Equal Unequal 21
$H_2 + O_2 \rightarrow H_2O$ ________ ________ Equal Unequal 22	$Na + Cl_2 \rightarrow NaCl$ ________ ________ Equal Unequal 23	$HgO \rightarrow Hg + O_2$ ________ ________ Equal Unequal 24
$Zn + Cl_2 \rightarrow ZnCl_2$ ________ ________ Equal Unequal 25	$NaOH + HCl \rightarrow NaCl + H_2O$ ________ ________ Equal Unequal 26	$Mg + O_2 \rightarrow MgO$ ________ ________ Equal Unequal 27
$Fe + S \rightarrow FeS$ ________ ________ Equal Unequal 28	$Al + S \rightarrow Al_2S_3$ ________ ________ Equal Unequal 29	$H_2 + Cl_2 \rightarrow 2HCl$ ________ ________ Equal Unequal 30

WORKSHEET ANSWERS

I.8.3 Count the Atoms

1. 3
2. 5
3. 6
4. 4
5. 6
6. 3
7. 5
8. 17
9. 3
10. 6
11. 5
12. 5
13. 13
14. 6
15. 5
16. 2
17. 3
18. 10
19. 3
20. 12
21. 5 → 5; equal
22. 4 → 3; unequal
23. 3 → 2; unequal
24. 2 → 3; unequal
25. 3 → 3; equal
26. 5 → 5; equal
27. 3 → 2; unequal
28. 2 → 2; equal
29. 2 → 5; unequal
30. 4 → 4; equal

TGT GAMESHEET: I.8.3 Count the Atoms

Ag_2S ______ 1	$Ba(OH)_2$ ______ 2	$Mg + O_2 \rightarrow MgO$ Equal Unequal 3
KNO_3 ______ 4	Al_2S_3 ______ 5	$Fe + S \rightarrow FeS$ Equal Unequal 6
$MgSO_4$ ______ 7	$Ba_3(PO_4)_2$ ______ 8	$Al + S \rightarrow Al_2S_3$ Equal Unequal 9
KCl ______ 10	K_2SO_3 ______ 11	$H_2 + Cl_2 \rightarrow 2HCl$ Equal Unequal 12
$CuSO_4$ ______ 13	$ZnSO_3$ ______ 14	2KCL ______ 15
Na_2O ______ 16	$H_2 + O_2 \rightarrow H_2O$ Equal Unequal 17	CCl_4 ______ 18
$AgNO_3$ ______ 19	$Na + Cl_2 \rightarrow NaCl$ Equal Unequal 20	$2Al_2O_3$ ______ 21
$Al_2(SO_4)_3$ ______ 22	$HgO \rightarrow Hg + O_2$ Equal Unequal 23	$2HCl + Zn \rightarrow ZnCl_2 + H_2$ Equal Unequal 24
$MgCl_2$ ______ 25	$Zn + Cl_2 \rightarrow ZnCl_2$ Equal Unequal 26	$2CuSO_4$ ______ 27
NH_4Cl ______ 28	$NaOH + HCl \rightarrow NaCl + H_2O$ Equal Unequal 29	$BaCl_2$ ______ 30

GAMESHEET ANSWERS

I.8.3 Count the Atoms

1. 3
2. 5
3. unequal
4. 5
5. 5
6. equal
7. 6
8. 13
9. unequal
10. 2
11. 6
12. equal
13. 6
14. 5
15. 4
16. 3
17. unequal
18. 5
19. 5
20. unequal
21. 10
22. 17
23. unequal
24. equal
25. 3
26. equal
27. 12
28. 6
29. equal
30. 3

TGT PHYSICAL SCIENCE

UNIT: Chemistry

WORKSHEET: Properties and Purification of Water

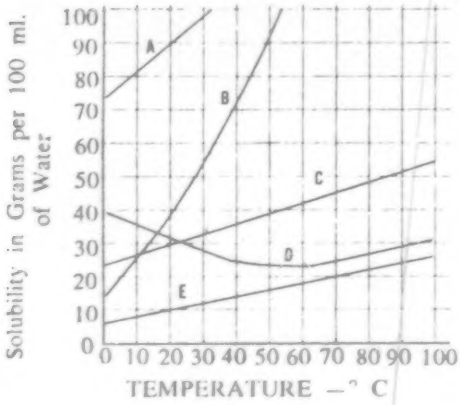
Objective: I.9--Students will identify the properties of water and demonstrate basic knowledge of the water purification process.

Instructions: This worksheet will help you prepare for the Properties and Purification of Water Game. Read each statement or question and choose the correct answer.

Vocabulary:

aeration
anhydrous
coagulation
distillation
filtration
hydrate
potable
pure water
sediment
solubility
solute
solution
solvent
specific heat

EFFECT OF TEMPERATURE ON SOLUBILITY



TGT WORKSHEET: I.9 Properties and Purification of Water

A single water molecule (H_2O) contains:

a) 2 atoms
b) 3 atoms
c) 1 atom

1

A single water molecule (H_2O) contains:

a) 2 elements
b) 3 elements
c) 1 element

2

Pure water is classified as:

a) an element
b) a compound
c) a mixture

3

Tap water is classified as:

a) an element
b) a compound
c) a mixture

4

The boiling point of pure water is:

a) 100° C
b) 212° C
c) 110° C

5

The freezing point of pure water is:

a) 32° C
b) 0° C
c) 10° C

6

Water is known as the universal:

a) solute
b) emulsion
c) solvent

7

Water takes a long time to heat and cool because of its:

a) molecular shape
b) density
c) high specific heat

8

When water freezes it:

a) contracts
b) expands
c) changes chemically

9

When water at room temperature is heated it:

a) expands
b) contracts
c) changes chemically

10

Boiling water will produce:

a) pure water
b) mineral free water
c) germ free water

11

Distilling water will produce:

a) pure water
b) potable water
c) germ free water

12

Alum is used in water treatment to:

a) kill germs
b) improve the taste
c) help settle dirt

13

Chlorine is used in water treatment to:

a) kill germs
b) improve the taste
c) help settle the dirt

14

Water is aerated in order to:

a) kill germs
b) improve the taste
c) help settle the dirt

15

TGT WORKSHEET: I.9 Properties and Purification of Water

Water is added to ________ an acid solution.

a) strengthen
b) concentrate
c) dilute

16

When water is taken out of a crystal the substance is called:

a) hydrated
b) anhydrous

17

A crystalline substance containing water is called:

a) hydrated
b) anhydrous

18

Hard water is water that contains:

a) sediment
b) minerals
c) bacteria

19

Distilled water has:

a) a salty taste
b) a sweet taste
c) no taste

20

You can increase the solubility rate of a substance by:

a) stirring it
b) cooling it
c) letting it alone

21

Evaporation and condensation are part of the process of:

a) aeration
b) distillation
c) coagulation

22

Filtering removes ________ from the water.

a) sediment
b) germs
c) minerals

23

The boiling point of pure water is:

a) 100° F
b) 212° F
c) 110° F

24

The freezing point of pure water is:

a) 32° F
b) 0° F
c) 10° F

25

Using the graph, which letter represents the compound least soluble at 73° C?

a) B
b) E
c) D

26

Using the graph, as the temperature increased, the solubility of compound C:

a) decreased
b) increased
c) remained the same

27

Using the graph, how many grams of compound C will be needed to saturate 100 ml. of water at 50° C?

a) 20
b) 80
c) 40

28

Using the graph, which letter represents the compound with the highest solubility at 30° C?

a) A
b) C
c) E

29

Using the graph, which letter represents the compound whose solubility increases most slightly as the temperature increases?

a) B
b) C
c) E

30

WORKSHEET ANSWERS

I.9 Properties and Purification of Water

1. b) 3 atoms
2. a) 2 elements
3. b) a compound
4. c) a mixture
5. a) 100° C
6. b) 0° C
7. c) solvent
8. c) high specific heat
9. b) expands
10. a) expands
11. c) germ free water
12. a) pure water
13. c) help settle dirt
14. a) kill germs
15. b) improve the taste
16. c) dilute
17. b) anhydrous
18. a) hydrated
19. b) minerals
20. c) no taste
21. a) stirring it
22. b) distillation
23. a) sediment
24. b) 212° F
25. a) 32° F
26. b) E
27. b) increased
28. c) 40
29. a) A
30. c) E

TGT GAMESHEET: I.9 Properties and Purification of Water

Evaporation and condensation are part of the ______ process:

a) aeration
b) distillation
c) coagulation

1

Water is added to ________ an acid solution.

a) strengthen
b) concentrate
c) dilute

2

Pure water is classified as:

a) an element
b) a compound
c) a mixture

3

Water is known as the universal:

a) solute
b) emulsion
c) solvent

4

The boiling point of pure water is:

a) 100° C
b) 212° C
c) 110° C

5

When water is taken out of a crystal the substance is called:

a) hydrated
b) anhydrous

6

Hard water is water that contains:

a) sediment
b) minerals
c) bacteria

7

Distilled water has:

a) a salty taste
b) a sweet taste
c) no taste

8

When water freezes it:

a) contracts
b) expands
c) chemically changes

9

You can increase the solubility rate of a substance by:

a) stirring it
b) cooling it
c) letting it alone

10

Boiling water will produce:

a) pure water
b) mineral free water
c) germ free water

11

Tap water is classified as:

a) an element
b) a compound
c) a mixture

12

Alum is used in water treatment to:

a) kill germs
b) improve the taste
c) help settle dirt

13

A crystalline substance containing water is called:

a) hydrated
b) anhydrous

14

A single water molecule contains:

a) 2 elements
b) 3 elements
c) 1 element

15

TGT GAMESHEET: I.9 Properties and Purification of Water

The freezing point of water is:

a) 32° C
b) 0° C
c) 10° C

16

Water takes a long time to heat and cool because of its:

a) molecular shape
b) density
c) high specific heat

17

Chlorine is used in water treatment to:

a) kill germs
b) improve the taste
c) help settle the dirt

18

Filtering removes ________ from the water.

a) sediment
b) germs
c) minerals

19

Water is aerated in order to:

a) kill germs
b) improve the taste
c) help settle the dirt

20

A single water molecule contains:

a) 2 atoms
b) 3 atoms
c) 1 atom

21

When water at room temperature is heated it:

a) expands
b) contracts
c) chemically changes

22

Distilling water will produce:

a) pure water
b) potable water
c) germ free water

23

Using the graph, as the temperature increased, the solubility of compound C:

a) decreased
b) increased
c) remained the same

24

Using the graph, which letter represents the compound whose solubility increases most slightly as the temperature increases?

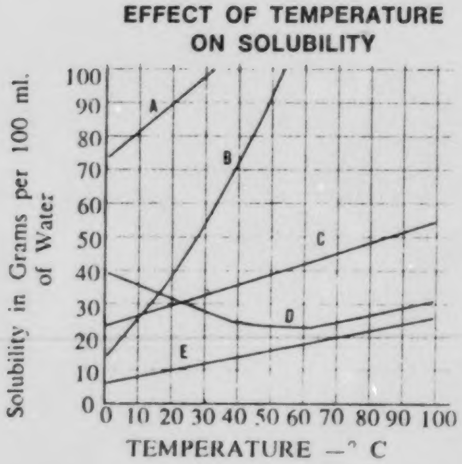
a) B
b) C
c) E

25

Using the graph, which letter represents the compound least soluble at 73° C?

a) B
b) E
c) D

26



GAMESHEET ANSWERS

I.9 Properties and Purification of Water

1. b) distillation
2. c) dilute
3. b) a compound
4. c) solvent
5. a) 100° C
6. b) anhydrous
7. b) minerals
8. c) no taste
9. b) expands
10. a) stirring it
11. c) germ free water
12. c) a mixture
13. c) help settle dirt
14. a) hydrated
15. a) 2 elements
16. b) 0° C
17. c) high specific heat
18. a) kill germs
19. a) sediment
20. b) improve the taste
21. b) 3 atoms
22. a) expands
23. a) pure water
24. b) increased
25. c) E
26. b) E

TGT PHYSICAL SCIENCE

UNIT: Chemistry

WORKSHEET: Bonding and Valence

Objective: I.10--a. Students will be able to determine the valence of common chemical elements.

b. Students will classify elements as metals, non-metals, or noble gases according to their valence.

Instructions: This worksheet will help you prepare for the Bonding and Valence Game. In items 1-16, unscramble the letters to form the correct word. In items 17-30, use the periodic table and the valence table to find the correct valence of each element. In the two spaces provided write the valence and the word "metal," "non-metal," or "noble gas."

Vocabulary:

chemical bond
covalent
electrons
energy
gain
inert
ionic
last shell
lose
metal
molecule
negative
noble gas
non-metal
positive
valence

Valence Chart

No. of e^- in last shell	Valence No.
1	+1
2	+2
3	+3
4	+4
5	-3
6	-2
7	-1
8	0

PERIODIC TABLE OF ELEMENTS

KEY: How to read each box.

Atomic number — 27
Symbol — Co
Name — Cobalt
Atomic weight — 58.9332

2 8 15 2 — Number of electrons in shell.

PERIOD	I A	II A	III B	IV B	V B	VI B	VII B	VIII	VIII	VIII	I B	II B	III A	IV A	V A	VI A	VII A	O
1	1 H Hydrogen 1.00797																	2 He Helium 4.0026
2	3 Li Lithium 6.939	4 Be Beryllium 9.0122											5 B Boron 10.811	6 C Carbon 12.01115	7 N Nitrogen 14.0067	8 O Oxygen 15.9994	9 F Fluorine 18.9984	10 Ne Neon 20.183
3	11 Na Sodium 22.9898	12 Mg Magnesium 24.312											13 Al Aluminum 26.9815	14 Si Silicon 28.086	15 P Phosphorus 30.9738	16 S Sulfur 32.064	17 Cl Chlorine 35.453	18 Ar Argon 39.948
4	19 K Potassium 39.102	20 Ca Calcium 40.08	21 Sc Scandium 44.956	22 Ti Titanium 47.90	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.9380	26 Fe Iron 55.847	27 Co Cobalt 58.9332	28 Ni Nickel 58.71	29 Cu Copper 63.54	30 Zn Zinc 65.37	31 Ga Gallium 69.72	32 Ge Germanium 72.59	33 As Arsenic 74.9216	34 Se Selenium 78.96	35 Br Bromine 79.909	36 Kr Krypton 83.80
5	37 Rb Rubidium 85.47	38 Sr Strontium 87.62	39 Y Yttrium 88.905	40 Zr Zirconium 91.22	41 Nb Niobium 92.906	42 Mo Molyb-denum 95.94	43 Tc Technetium (99)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.905	46 Pd Palladium 106.4	47 Ag Silver 107.870	48 Cd Cadmium 112.40	49 In Indium 114.82	50 Sn Tin 118.69	51 Sb Antimony 121.75	52 Te Tellurium 127.60	53 I Iodine 126.9044	54 Xe Xenon 131.30
6	55 Cs Cesium 132.905	56 Ba Barium 137.34	57-71 See note.	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.85	75 Re Rhenium 186.2	76 Os Osmium 190.2	77 Ir Iridium 192.2	78 Pt Platinum 195.09	79 Au Gold 196.967	80 Hg Mercury 200.59	81 Tl Thallium 204.37	82 Pb Lead 207.19	83 Bi Bismuth 208.980	84 Po Polonium (210)	85 At Astatine (210)	86 Rn Radon (222)
7	87 Fr Francium (223)	88 Ra Radium (226)																

TGT WORKSHEET: I.10 Bonding and Valence

Atoms that share EESROTNL are joined by a chemical bond. ________ 1

The atoms in a molecule are held together by MAECCLIH DNOB. ________ 2

Two hydrogen atoms share electrons to form a hydrogen CELELOUM. ________ 3

Atoms of elements known as metals OLES electrons to become stable. ________ 4

Atoms of elements known as non-metals ANIG electrons to become stable. ________ 5

Atoms of elements known as BOLNE EAGSS do not gain or lose electrons to become stable. ________ 6

LANVCEE describes the number of electrons an atom gains, loses or shares to form a chemical bond. ________ 7

Atoms that give up electrons have a SOVTIIEP valence. ________ 8

Atoms that receive electrons have a TEEGAVIN valence. ________ 9

The valence electrons of an atom are found in the RTUEO HLELS of the atom. ________ 10

Elements that are not chemically active are RITEN. ________ 11

Elements that gain electrons are classified as ONN ETMLAS. ________ 12

When atoms transfer electrons to fill their outer shells, they form NICOI bonds. ________ 13

When bonds are formed or broken GERYNE is lost or gained. ________ 14

Elements that lose electrons are classified as ETMLAS. ________ 15

Atoms that share electrons form a LAVCOENT bond. ________ 16

oxygen ________ ________ 17

fluorine ________ ________ 18

helium ________ ________ 19

sodium ________ ________ 20

iodine ________ ________ 21

chlorine ________ ________ 22

magnesium ________ ________ 23

neon ________ ________ 24

beryllium ________ ________ 25

calcium ________ ________ 26

nitrogen ________ ________ 27

lithium ________ ________ 28

barium ________ ________ 29

aluminum ________ ________ 30

WORKSHEET ANSWERS

I.10 Bonding and Valence

1. electrons
2. chemical bond
3. molecule
4. lose
5. gain
6. noble gases
7. valence
8. positive
9. negative
10. last shell
11. inert
12. non-metals
13. ionic
14. energy
15. metals
16. covalent
17. -2, non-metal
18. -1, non-metal
19. 0, noble gas
20. +1, metal
21. -1, non-metal
22. -1, non-metal
23. +2, metal
24. 0, noble gas
25. +2, metal
26. +2, metal
27. -3, non-metal
28. +1, metal
29. +2, metal
30. -3, non-metal

PERIODIC TABLE OF ELEMENTS

KEY: How to read each box.

Atomic number — 27
Symbol — Co
Name — Cobalt
Atomic weight — 58.9332
2 8 15 2 — Number of electrons in shell.

ERIOD	I A	II A	III B	IV B	V B	VI B	VII B	VIII	VIII	VIII	I B	II B	III A	IV A	V A	VI A	VII A	O
1	1 H Hydrogen 1.00797 1																	2 He Helium 4.0026 2
2	3 Li Lithium 6.939 2 1	4 Be Beryllium 9.0122 2 2											5 B Boron 10.811 2 3	6 C Carbon 12.01115 2 4	7 N Nitrogen 14.0067 2 5	8 O Oxygen 15.9994 2 6	9 F Fluorine 18.9984 2 7	10 Ne Neon 20.183 2 8
3	11 Na Sodium 22.9898 2 8 1	12 Mg Magnesium 24.312 2 8 2											13 Al Aluminum 26.9815 2 8 3	14 Si Silicon 28.086 2 8 4	15 P Phosphorus 30.9738 2 8 5	16 S Sulfur 32.064 2 8 6	17 Cl Chlorine 35.453 2 8 7	18 Ar Argon 39.948 2 8 8
4	19 K Potassium 39.102 2 8 8 1	20 Ca Calcium 40.08 2 8 8 2	21 Sc Scandium 44.956 2 8 9 2	22 Ti Titanium 47.90 2 8 10 2	23 V Vanadium 50.942 2 8 11 2	24 Cr Chromium 51.996 2 8 13 1	25 Mn Manganese 54.9380 2 8 13 2	26 Fe Iron 55.847 2 8 14 2	27 Co Cobalt 58.9332 2 8 15 2	28 Ni Nickel 58.71 2 8 16 2	29 Cu Copper 63.54 2 8 18 1	30 Zn Zinc 65.37 2 8 18 2	31 Ga Gallium 69.72 2 8 18 3	32 Ge Germanium 72.59 2 8 18 4	33 As Arsenic 74.9216 2 8 18 5	34 Se Selenium 78.96 2 8 18 6	35 Br Bromine 79.909 2 8 18 7	36 Kr Krypton 83.80 2 8 18 8
5	37 Rb Rubidium 85.47 2 8 18 8 1	38 Sr Strontium 87.62 2 8 18 8 2	39 Y Yttrium 88.905 2 8 18 9 2	40 Zr Zirconium 91.22 2 8 18 10 2	41 Nb Niobium 92.906 2 8 18 12 1	42 Mo Molybdenum 95.94 2 8 18 13 1	43 Tc Technetium (99) 2 8 18 13 2	44 Ru Ruthenium 101.07 2 8 18 15 1	45 Rh Rhodium 102.905 2 8 18 16 1	46 Pd Palladium 106.4 2 8 18 18 0	47 Ag Silver 107.870 2 8 18 18 1	48 Cd Cadmium 112.40 2 8 18 18 2	49 In Indium 114.82 2 8 18 18 3	50 Sn Tin 118.69 2 8 18 18 4	51 Sb Antimony 121.75 2 8 18 18 5	52 Te Tellurium 127.60 2 8 18 18 6	53 I Iodine 126.9044 2 8 18 18 7	54 Xe Xenon 131.30 2 8 18 18 8
6	55 Cs Cesium 132.905 2 8 18 18 8 1	56 Ba Barium 137.34 2 8 18 18 8 2	57-71 See note.	72 Hf Hafnium 178.49 2 8 18 32 10 2	73 Ta Tantalum 180.948 2 8 18 32 11 2	74 W Tungsten 183.85 2 8 18 32 12 2	75 Re Rhenium 186.2 2 8 18 32 13 2	76 Os Osmium 190.2 2 8 18 32 14 2	77 Ir Iridium 192.2 2 8 18 32 15 2	78 Pt Platinum 195.09 2 8 18 32 17 1	79 Au Gold 196.967 2 8 18 32 18 1	80 Hg Mercury 200.59 2 8 18 32 18 2	81 Tl Thallium 204.37 2 8 18 32 18 3	82 Pb Lead 207.19 2 8 18 32 18 4	83 Bi Bismuth 208.980 2 8 18 32 18 5	84 Po Polonium (210) 2 8 18 32 18 6	85 At Astatine (210) 2 8 18 32 18 7	86 Rn Radon (222) 2 8 18 32 18 8
7	87 Fr Francium (223) 2 8 18 32 18 8 1	88 Ra Radium (226) 2 8 18 32 18 8 2																

TGT GAMESHEET: I.10 Bonding and Valence

When atoms transfer electrons to fill their outer shells, they form ________ bonds. 1	Atoms of elements known as non-metals ________ electrons to become stable. 2	Atoms of elements known as ________ do not gain or lose electrons to become stable. 3
Atoms that share ________ are joined by a chemical bond. 4	Atoms that give up electrons have a ________ valence. 5	Two hydrogen atoms share electrons to form a hydrogen ________. 6
Atoms of elements known as metals ________ electrons to become stable. 7	Elements which are not chemically active are ________. 8	Elements that gain electrons are classified as ________. 9
________ describes the number of electrons an atom gains, loses or shares to form a chemical bond. 10	When bonds are formed or broken ________ is either taken in or given off. 11	Atoms that receive electrons have a ________ valence. 12
The valence electrons of an atom are found in the ________ of the atom. 13	The atoms in a molecule are held together by ________. 14	Atoms that share electrons form ________ bonds. 15
nitrogen ________ ________ 16	beryllium ________ ________ 17	fluorine ________ ________ 18
aluminum ________ ________ 19	sodium ________ ________ 20	iodine ________ ________ 21
calcium ________ ________ 22	helium ________ ________ 23	barium ________ ________ 24
lithium ________ ________ 25	oxygen ________ ________ 26	bromine ________ ________ 27
potassium ________ ________ 28	neon ________ ________ 29	chlorine ________ ________ 30

GAMESHEET ANSWERS

I.10 Bonding and Valence

1. ionic
2. gain
3. noble gases
4. electrons
5. positive
6. molecule
7. lose
8. inert
9. non-metals
10. valence
11. energy
12. negative
13. last shell
14. chemical bonds
15. covalent
16. -3, non-metal
17. +2, metal
18. -1, non-metal
19. +3, metal
20. +1, metal
21. -1, non-metal
22. +2, metal
23. 0, noble gas
24. +2, metal
25. +1, metal
26. -2, non-metal
27. -1, non-metal
28. -1, non-metal
29. 0, noble gas
30. -1, non-metal

TGT PHYSICAL SCIENCE

UNIT: Chemistry

WORKSHEET: Making Chemical Formulas

Objective: I.11--Students will arrange elements and radicals to produce correct chemical formulas.

Instructions: This worksheet will help you prepare for the Making Chemical Formulas Game. In each item an element symbol with a valence, and a radical symbol and valence are presented. Choose the correct answer from among the choices provided.

Vocabulary:

compound
element
formula
radical ion
subscript
symbol
valence

Examples and Explanations

I. $\boxed{Mg^{+2} + O^{-2} \rightarrow MgO}$

Step 1. Crisscross the valences and drop their signs.

$$\begin{array}{ll} Mg^{+2} & + O^{-2} \\ Mg_{2} & + O_{2} \end{array}$$

Step 2. When the valence numbers are the same, cancel them. The formula therefore is $\underline{MgO}$.

II. $\boxed{Mg^{+2} + Cl^{-1} \rightarrow MgCl_2}$

Step 1. Crisscross the valences and drop their signs.

$$\begin{array}{ll} Mg^{+2} & + Cl^{-1} \\ Mg_{1} & + Cl_{2} \end{array}$$

Step 2. The two valence numbers are different. Drop the (1) because it is understood. Leave the 2. The formula is $MgCl_2$.

III. $\boxed{Na^{+1} + (SO_4)^{-2} \rightarrow Na_2SO_4}$

Step 1. Crisscross the valences and drop their signs.

$$\begin{array}{ll} Na^{+1} & + (SO_4)^{-2} \\ Na_{2} & + (SO_4)_{1} \end{array}$$

Step 2. The two valence numbers are different. Drop the (1) because it is understood. Since a number is not needed you may drop the parentheses. Leave the 2. The formula is $\underline{Na_2SO_4}$.

IV. $\boxed{Al^{+3} + (SO_4)^{-2} \rightarrow Al_2(SO_4)_3}$

Step 1. Crisscross the valences and drop their signs.

$$\begin{array}{ll} Al^{+3} & + (SO_4)^{-2} \\ Al_{2} & + (SO_4)_{3} \end{array}$$

Step 2. The two valence numbers are different. Keep both numbers and the parentheses. The formula should read $\underline{Al_2(SO_4)_3}$.

V. $\boxed{(NH_4)^{+1} + (NO_3)^{-1} \rightarrow NH_4NO_3}$

Step 1. Crisscross the valences and drop their signs.

$$\begin{array}{ll} (NH_4)^{+1} & + (NO_3)^{-1} \\ (NH_4)_{1} & + (NO_3)_{1} \end{array}$$

Step 2. When the valence numbers are the same, drop them. Since the numbers are not needed the parentheses may be dropped. The formula is $\underline{NH_4NO_3}$.

TGT WORKSHEET: I.11 Making Chemical Formulas

$Zn^{+2} + Cl^{-1}$

a) $ZnCl_2$

b) Zn_2Cl

c) Cl_2Zn

d) $ZnCl$

1

$Ca^{+2} + O^{-2}$

a) CaO_2

b) Ca_2O_2

c) OCa

d) CaO

2

$H^{+} + O^{+2}$

a) HO_2

b) H_2O

c) OH_2

d) HO

3

$K^{+1} + (NO_3)^{-1}$

a) $K(NO_3)_2$

b) $K\ NO_4$

c) K_2NO_3

d) KNO_3

4

$K^{+1} + (SO_4)^{-2}$

a) KSO_3

b) $K(SO_4)_2$

c) K_2SO_4

d) KSO_4

5

$Al^{+3} + (SO_4)^{-2}$

a) $Al_3(SO_4)_2$

b) $Al_2(SO_4)_3$

c) Al_2SO_7

d) $AlSO_4$

6

$Al^{+3} + (OH)^{-1}$

a) $Al(OH)_3$

b) $AlOH_3$

c) Al_3OH

d) Al_2OH

7

$Na^{+1} + Cl^{-1}$

a) $NaCl_2$

b) $ClNa$

c) $NaCl$

d) Na_2Cl

8

$Na^{+1} + O^{-2}$

a) NaO_2

b) ONa

c) NaO

d) Na_2O

9

$Mg^{+2} + O^{-2}$

a) MgO_2

b) Mg_2O

c) MgO

d) Mg_2O_2

10

$Mg^{+2} + (PO_4)^{-3}$

a) $Mg_3(PO_4)_2$

b) $Mg_2(PO_4)_3$

c) Mg_3PO_6

d) $MgPO_4$

11

$Al^{+3} + (PO_4)^{-3}$

a) $Al_3(PO_4)_3$

b) $AlPO_4$

c) Al_3PO_7

d) $Al_3(PO_4)_2$

12

$H^{+1} + S^{-2}$

a) HS_2

b) HS

c) SH_2

d) H_2S

13

$Al^{+3} + S^{-2}$

a) Al_3S_2

b) Al_2S_3

c) AlS

d) S_2Al

14

$Fe^{+2} + S^{-2}$

a) Fe_2S_2

b) Fe_2S

c) FeS

d) FeS_2

15

TGT WORKSHEET: I.11 Making Chemical Formulas

$Al^{+3} + O^{-2}$

a) Al_2O_3

b) Al_3O_2

c) AlO

d) AlO_3

16

$(NH_4)^{+1} + (OH)^{-1}$

a) NH_5O

b) NH_5OH

c) $NH_4(OH)_2$

d) NH_4OH

17

$(NH_4)^{+1} + (CO_3)^{-2}$

a) $NH_4(CO_3)_2$

b) $(NH_4)_2CO_3$

c) NH_6CO_3

d) $(NH_4)_2CO_4$

18

$Cu^{+2} + Cl^{-1}$

a) $CuCl_2$

b) $CuCl$

c) Cu_2Cl

d) $ClCu_2$

19

$C^{+4} + O^{-2}$

a) C_4O_2

b) CO_2

c) C_4O

20

$C^{+4} + Cl^{-1}$

a) CCl

b) C_4Cl

c) C_3Cl

d) CCl_4

21

$Fe^{+3} + O^{-2}$

a) Fe_3O_2

b) FeO

c) FeO_3

d) Fe_2O_3

22

$Fe^{+3} + (OH)^{-1}$

a) Fe_3OH

b) $FeOH_3$

c) $Fe(OH)_3$

d) $Fe_3(OH)_3$

23

$Ag^{+1} + S^{-2}$

a) AgS_2

b) Ag_2S

c) AgS

d) SAg

24

$Ca^{+2} + I^{-1}$

a) Ca_2I

b) CaI

c) CaI_2

d) Ca_2I_2

25

$K^{+1} + I^{-1}$

a) KI

b) K_2I

c) KI_2

d) K_2I_2

26

$(NH_4)^{+1} + I^{-1}$

a) NH_5I

b) NH_4I

c) NHI

d) $(NH_4)_2I$

27

$H^{+1} + (SO_4)^{-2}$

a) $H(SO_4)_2$

b) HSO_4

c) H_3SO_4

d) H_2SO_4

28

$Ba^{+2} + (OH)^{-1}$

a) Ba_2OH

b) $Ba(OH)_2$

c) $BaOH_2$

d) $BaOH$

29

$C^{+4} + S^{-2}$

a) CS

b) C_4S_2

c) CS_2

d) CS_4

30

WORKSHEET ANSWERS

I.11 Making Chemical Formulas

1. a, $ZnCl_2$
2. d, CaO
3. b, H_2O
4. d, KNO_3
5. c, K_2SO_4
6. b, $Al_2(SO_4)_3$
7. a, $Al(OH)_3$
8. c, $NaCl$
9. d, Na_2O
10. c, MgO
11. a, $Mg_3(PO_4)_2$
12. b, $AlPO_4$
13. d, H_2S
14. b, Al_2S_3
15. c, FeS
16. a, Al_2O_3
17. d, NH_4OH
18. b, $(NH_4)_2CO_3$
19. a, $CuCl_2$
20. b, CO_2
21. d, CCl_4
22. d, Fe_2O_3
23. c, $Fe(OH)_3$
24. b, Ag_2S
25. c, CaI_2
26. a, KI
27. b, NH_4I
28. d, H_2SO_4
29. b, $Ba(OH)_2$
30. c, CS_2

TGT GAMESHEET: I.11 Making Chemical Formulas

$Zn^{+2} + Cl^{-1}$ a) $ZnCl_2$ b) Zn_2Cl c) $ZnCl$ 1	$Mg^{+2} + (PO_4)^{-3}$ a) $Mg_3(PO_4)_2$ b) $Mg_2(PO_4)_3$ c) Mg_3PO_6 2	$C^{+4} + Cl^{-1}$ a) CCl b) C_4Cl c) CCl_4 3
$Ca^{+2} + O^{+2}$ a) CaO_2 b) Ca_2O_2 c) CaO 4	$Al^{+3} + (PO_4)^{-3}$ a) $Al_3(PO_4)_3$ b) $AlPO_4$ c) Al_3PO_7 5	$Fe^{+3} + O^{-2}$ a) Fe_3O_2 b) FeO c) Fe_2O_3 6
$H^{+1} + O^{-2}$ a) HO_2 b) H_2O c) HO 7	$H^{+1} + S^{-2}$ a) HS_2 b) HS c) H_2S 8	$Fe^{+3} + (OH)^{-1}$ a) Fe_3OH b) $FeOH_3$ c) $Fe(OH)_3$ 9
$K^{+1} + (NO_3)^{-1}$ a) $K(NO_3)_2$ b) K_2NO_3 c) KNO_3 10	$Al^{+3} + S^{-2}$ a) Al_3S_2 b) Al_2S_3 c) AlS 11	$Ag^{+1} + S^{-2}$ a) AgS_2 b) Ag_2S c) AgS 12
$K^{+1} + (SO_4)^{-2}$ a) KSO_3 b) $K(SO_4)_2$ c) K_2SO_4 13	$Fe^{+2} + S^{-2}$ a) Fe_2S_2 b) Fe_2S c) FeS 14	$Ca^{+2} + I^{-1}$ a) Ca_2I b) CaI c) CaI_2 15

TGT GAMESHEET: I.11 Making Chemical Formulas

$Al^{+3} + (SO_4)^{-2}$ a) $Al_3(SO_4)_2$ b) $Al_2(SO_4)_3$ c) Al_2SO_7 16	$Al^{+3} + O^{-2}$ a) Al_2O_3 b) Al_3O_2 c) Al) 17	$K^{+1} + I^{-1}$ a) KI b) K_2I c) KI_2 18
$Al^{+3} + (OH)^{-1}$ a) $Al(OH)_3$ b) $AlOH_3$ c) Al_3OH 19	$(NH_4)^{+1} + (OH)^{-1}$ a) NH_5OH b) $NH_4(OH)_2$ c) NH_4OH 20	$(NH_4)^{+1} + I^{-1}$ a) NH_5I b) NH_4I c) NHI 21
$Na^{+1} + Cl^{-1}$ a) $NaCl_2$ b) ClNa c) NaCl 22	$(NH)_4^{+1} + (CO_3)^{-2}$ a) $NH_4(CO_3)_2$ b) $(NH_4)_2CO_3$ c) NH_6CO_3 23	$H^{+1} + (SO_4)^{-2}$ a) $H(SO_4)_2$ b) H_3SO_4 c) H_2SO_4 24
$Na^{+1} + O^{-2}$ a) NaO_2 b) NaO c) Na_2O 25	$Cu^{+2} + Cl^{-1}$ a) $CuCl_2$ b) CuCl c) Cu_2Cl 26	$Ba^{+2} + (OH)^{-1}$ a) Ba_2OH b) $Ba(OH)_2$ c) $BaOH_2$ 27
$Mg^{+2} + O^{-2}$ a) MgO_2 b) Mg_2O c) MgO 28	$C^{+4} + O^{-2}$ a) C_4O_2 b) CO_2 c) C_4O 29	$C^{+4} + S^{-2}$ a) CS b) C_4S_2 c) CS_2 30

GAMESHEET ANSWERS

I.11 Making Chemical Formulas

1. a, $ZnCl_2$
2. a, $Mg_3(PO_4)_2$
3. c, CCl_4
4. c, CaO
5. b, $AlPO_4$
6. c, Fe_2O_3
7. b, H_2O
8. c, H_2S
9. c, $Fe(OH)_3$
10. c, KNO_3
11. b, Al_2S_3
12. b, Ag_2S
13. c, K_2SO_4
14. c, FeS
15. c, CaI_2
16. b, $Al_2(SO_4)_3$
17. a, Al_2O_3
18. a, KI
19. a, $Al(OH)_3$
20. a, NH_4OH
21. b, NH_4I
22. c, $NaCl$
23. b, $(NH_4)_2CO_3$
24. c, H_2SO_4
25. c, Na_2O
26. a, $CuCl_2$
27. b, $Ba(OH)_2$
28. c, MgO
29. b, CO_2
30. c, CS_2

TGT PHYSICAL SCIENCE
UNIT: Chemistry
WORKSHEET: Identify the Reaction

Objective: I.12--Students will identify reactions by examining their equations.

Instructions: This worksheet will help you prepare for the Identify the Reaction Game. Study the "Basic Chemical Reaction" sheet. Identify each reaction as composition, decomposition, replacement, or double replacement. In the tournament you will not use the "Basic Chemical Reaction" sheet, but will choose by multiple choice.

Vocabulary:

- composition
- compound
- decomposition
- double replacement
- element
- equation
- radical ion
- reaction
- replacement
- yields (⟶)

Common Radical List:

1. CO_3-Carbonate
2. ClO_3-Chlorate
3. OH-Hydroxide
4. NO_3-Nitrate
5. PO_4-Phosphate
6. SO_4-Sulfate

Basic Chemical Reactions

Composition

Examples:

Element + Element → Compound

$$a + b \rightarrow ab$$

$$Fe + S \rightarrow FeS$$

Decomposition

Examples:

Compound → Element + Element

$$ab \rightarrow a + b$$

$$2HgO \rightarrow 2Hg + O_2$$

Replacement

Example:

Element + Compound → Element + New Compound

$$a + bc \rightarrow b + ac$$

$$Fe + CuCl_2 \rightarrow Cu + FeCl_2$$

or

$$a + bxy \rightarrow b + axy$$

$$Zn + H_2SO_4 \rightarrow H_2 + ZnSO_4$$

Double Replacement

Example:

Compound + Compound → New Compound + New Compound

$$ab + cd \rightarrow cb + ad$$

$$Na_2S + CuCl_2 \rightarrow CuS + 2NaCl$$

or

$$ab + cxy \rightarrow cb + axy$$

$$KCl + AgNO_3 \rightarrow AgCl + KNO_3$$

TGT WORKSHEET: I.12 Identify the Reaction

Hydrogen Chloride + Zinc → Hydrogen + Zinc Chloride

a) composition
b) decomposition
c) replacement
d) double replacement

1

Mercuric Oxide → Mercury + Oxygen

a) composition
b) decomposition
c) replacement
d) double replacement

2

Carbon + Oxygen → Carbon Dioxide

a) composition
b) decomposition
c) replacement
d) double replacement

3

Water → Hydrogen + Oxygen

a) composition
b) decomposition
c) replacement
d) double replacement

4

Copper + Silver Nitrate → Silver + Copper Nitrate

a) composition
b) decomposition
c) replacement
d) double replacement

5

Calcium Chloride + Sodium Carbonate → Sodium Chloride + Calcium Carbonate

a) composition
b) decomposition
c) replacement
d) double replacement

6

Sodium + Chlorine → Sodium Chloride

a) composition
b) decomposition
c) replacement
d) double replacement

7

Bromine + Sodium Iodide → Iodine + Sodium Bromide

a) composition
b) decomposition
c) replacement
d) double replacement

8

Copper Chloride → Copper + Chlorine

a) composition
b) decomposition
c) replacement
d) double replacement

9

Sodium Sulfide + Copper Chloride → Copper Sulfide + Socium Chloride

a) composition
b) decomposition
c) replacement
d) double replacement

10

Iron + Sulfur → Iron Sulfide

a) composition
b) decomposition
c) replacement
d) double replacement

11

Hydrogen Chloride + Sodium Hydroxide → Sodium Chloride + Water

a) composition
b) decomposition
c) replacement
d) double replacement

12

Iron + Hydrogen Sulfate → Hydrogen + Iron Sulfate

a) composition
b) decomposition
c) replacement
d) double replacement

13

Potassium + Iodine → Potassium Iodide

a) composition
b) decomposition
c) replacement
d) double replacement

14

(Nitric Acid)
Hydrogen Nitrate + Potassium Hydroxide → Potassium Nitrate + Water

a) composition
b) decomposition
c) replacement
d) double replacement

15

TGT WORKSHEET: I.12 Identify the Reaction

Silver Oxide → Silver + Oxygen

a) composition
b) decomposition
c) replacement
d) double replacement

16

$KCl + AgNO_3 \rightarrow AgCl + KNO_3$

a) composition
b) decomposition
c) replacement
d) double replacement

17

$2Fe + O_2 \rightarrow 2FeO$

a) composition
b) decomposition
c) replacement
d) double replacement

18

$CuCl_2 \rightarrow Cu + Cl_2$

a) composition
b) decomposition
c) replacement
d) double replacement

19

$2H_2 + O_2 \rightarrow 2H_2O$

a) composition
b) decomposition
c) replacement
d) double replacement

20

$Fe + CuCl_2 \rightarrow Cu + FeCl_2$

a) composition
b) decomposition
c) replacement
d) double replacement

21

$HNO_3 + KOH \rightarrow KNO_3 + H_2O$

a) composition
b) decomposition
c) replacement
d) double replacement

22

$2H_2O \rightarrow 2H_2 + O_2$

a) composition
b) decomposition
c) replacement
d) double replacement

23

$HCl + NaOH \rightarrow NaCl + H_2O$

a) composition
b) decomposition
c) replacement
d) double replacement

24

$Fe + S \rightarrow FeS$

a) composition
b) decomposition
c) replacement
d) double replacement

25

$Fe + 2HCl \rightarrow H_2 + FeCl_2$

a) composition
b) decomposition
c) replacement
d) double replacement

26

$2HgO \rightarrow 2Hg + O_2$

a) composition
b) decomposition
c) replacement
d) double replacement

27

$Cl_2 + 2KI \rightarrow I_2 + 2KCl$

a) composition
b) decomposition
c) replacement
d) double replacement

28

$BaCl_2 + Na_2SO_4 \rightarrow 2NaCl + BaSO_4$

a) composition
b) decomposition
c) replacement
d) double replacement

29

$2KClO_3 \rightarrow 2KCl + 3O_2$

a) composition
b) decomposition
c) replacement
d) double replacement

30

WORKSHEET ANSWERS

I.12 Identify the Reaction

1. c) replacement
2. b) decomposition
3. a) composition
4. b) decomposition
5. c) replacement
6. d) double replacement
7. a) composition
8. c) replacement
9. b) decomposition
10. d) double replacement
11. a) composition
12. a) double replacement
13. c) replacement
14. a) composition
15. d) double replacement
16. b) decomposition
17. d) double replacement
18. a) composition
19. b) decomposition
20. c) replacement
21. c) replacement
22. d) double replacement
23. b) decomposition
24. d) double replacement
25. a) composition
26. c) replacement
27. b) decomposition
28. c) replacement
29. d) double replacement
30. b) decomposition

TGT GAMESHEET: I.12 Identify the Reaction

$2HCl + Zn \rightarrow ZnCl_2 + H_2$

a) composition
b) decomposition
c) replacement
d) double replacement

1

$C + O_2 \rightarrow CO_2$

a) composition
b) decomposition
c) replacement
d) double replacement

2

Potassium Chloride + Silver Nitrate → Silver Chloride + Potassium Nitrate

a) composition
b) decomposition
c) replacement
d) double replacement

3

$2H_2O \rightarrow 2H_2 + O_2$

a) composition
b) decomposition
c) replacement
d) double replacement

4

Calcium Chloride + Sodium Carbonate → Sodium Chloride + Calcium Carbonate

a) composition
b) decomposition
c) replacement
d) double replacement

5

Hydrogen + Oxygen → Water

a) composition
b) decomposition
c) replacement
d) double replacement

6

Sodium + Chlorine → Sodium Chloride

a) composition
b) decomposition
c) replacement
d) double replacement

7

Copper Chloride → Copper + Chlorine

a) composition
b) decomposition
c) replacement
d) double replacement

8

$Fe + 2HCl \rightarrow H_2 + FeCl_2$

a) composition
b) decomposition
c) replacement
d) double replacement

9

$HCl + NaOH \rightarrow NaCl + H_2O$

a) composition
b) decomposition
c) replacement
d) double replacement

10

Water → Hydrogen + Oxygen

a) composition
b) decomposition
c) replacement
d) double replacement

11

Sodium Sulfide + Copper Chloride → Copper Sulfide + Sodium Chloride

a) composition
b) decomposition
c) replacement
d) double replacement

12

$Fe + H_2SO_4 \rightarrow H_2 + FeSO_4$

a) composition
b) decomposition
c) replacement
d) double replacement

13

$BaCl_2 + Na_2SO_4 \rightarrow 2NaCl + BaSO_4$

a) composition
b) decomposition
c) replacement
d) double replacement

14

$HNO_3 + KOH \rightarrow KNO_3 + H_2O$

a) composition
b) decomposition
c) replacement
d) double replacement

15

TGT GAMESHEET: I.12 Identify the Reaction

Iron + Sulfur → Iron Sulfide

a) composition
b) decomposition
c) replacement
d) double replacement

16

Silver Oxide → Silver + Oxygen

a) composition
b) decomposition
c) replacement
d) double replacement

17

$2HgO \rightarrow 2Hg + O_2$

a) composition
b) decomposition
c) replacement
d) double replacement

18

$CuCl_2 \rightarrow Cu + Cl_2$

a) composition
b) decomposition
c) replacement
d) double replacement

19

$Fe + CuCl_2 \rightarrow Cu + FeCl_2$

a) composition
b) decomposition
c) replacement
d) double replacement

20

$Cl_2 + 2KI \rightarrow I_2 + 2KCl$

a) composition
b) decomposition
c) replacement
d) double replacement

21

$Br_2 + NaI \rightarrow I_2 + NaBr$

a) composition
b) decomposition
c) replacement
d) double replacement

22

Mercuric Oxide → Mercury + Oxygen

a) composition
b) decomposition
c) replacement
d) double replacement

23

Hydrogen Chloride + Sodium Hydroxide → Sodium Chloride + Water

a) composition
b) decomposition
c) replacement
d) double replacement

24

Copper + Silver Nitrate → Silver + Copper Nitrate

a) composition
b) decomposition
c) replacement
d) double replacement

25

$Fe + S \rightarrow FeS$

a) composition
b) decomposition
c) replacement
d) double replacement

26

$2K + I_2 \rightarrow 2KI$

a) composition
b) decomposition
c) replacement
d) double replacement

27

Hydrogen Nitrate + Potassium Hydroxide → Potassium Nitrate + Water

a) composition
b) decomposition
c) replacement
d) double replacement

28

$2KClO_3 \rightarrow 2KCl + 3O_2$

a) composition
b) decomposition
c) replacement
d) double replacement

29

Iron + Oxygen → Iron Oxide

a) composition
b) decomposition
c) replacement
d) double replacement

30

GAMESHEET ANSWERS

I.12 Identify the Reaction

1. c) replacement
2. a) composition
3. d) double replacement
4. b) decomposition
5. d) double replacement
6. a) composition
7. a) composition
8. b) decomposition
9. c) replacement
10. d) double replacement
11. b) decomposition
12. d) double replacement
13. c) replacement
14. d) double replacement
15. d) double replacement
16. a) composition
17. b) decomposition
18. b) decomposition
19. b) decomposition
20. c) replacement
21. c) replacement
22. c) replacement
23. b) decomposition
24. d) double replacement
25. c) replacement
26. a) composition
27. a) composition
28. d) double replacement
29. b) decomposition
30. a) composition

TGT PHYSICAL SCIENCE

UNIT: Chemistry

WORKSHEET: Organic and Inorganic Formulas

Objective: I.13--a. Students will construct a simple molecular formula when given the structural formula.

b. Students will identify a given structural formula as being either organic or inorganic.

Instructions: This worksheet will help you prepare for the Organic and Inorganic Formulas Game. A structural formula is presented in each item. For items 1-15, write the simple molecular formula for each molecule or compound. For items 16-30, identify each molecule or compound as being organic or inorganic. In the tournament, you will be expected to identify each formula as organic or inorganic and give the molecular formula.

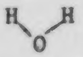
Vocabulary:

bond
inorganic compound
organic compound
simple molecular formula
structural formula

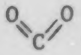
TGT WORKSHEET: I.13 Organic and Inorganic Formulas

Na-Cl

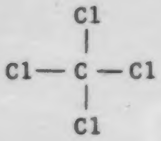
1



2



3

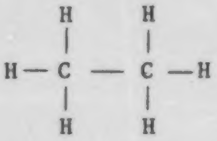


$$\begin{array}{ccccc} & & \mathrm{Cl} & & \\ & & | & & \\ \mathrm{Cl} & - & \mathrm{C} & - & \mathrm{Cl} \\ & & | & & \\ & & \mathrm{Cl} & & \end{array}$$

4

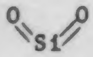
Cu-S

5

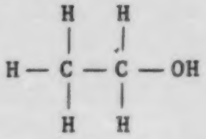


$$\begin{array}{ccccccc} & & \mathrm{H} & & \mathrm{H} & & \\ & & | & & | & & \\ \mathrm{H} & - & \mathrm{C} & - & \mathrm{C} & - & \mathrm{H} \\ & & | & & | & & \\ & & \mathrm{H} & & \mathrm{H} & & \end{array}$$

6



7

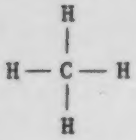


$$\begin{array}{ccccccc} & & \mathrm{H} & & \mathrm{H} & & \\ & & | & & | & & \\ \mathrm{H} & - & \mathrm{C} & - & \mathrm{C} & - & \mathrm{OH} \\ & & | & & | & & \\ & & \mathrm{H} & & \mathrm{H} & & \end{array}$$

8

K-I

9



$$\begin{array}{ccccc} & & \mathrm{H} & & \\ & & | & & \\ \mathrm{H} & - & \mathrm{C} & - & \mathrm{H} \\ & & | & & \\ & & \mathrm{H} & & \end{array}$$

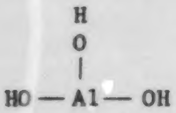
10

O-O

11

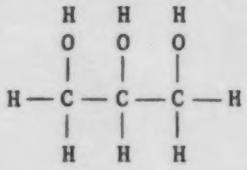
Ag-S-Ag

12



$$\begin{array}{ccccc} & & \mathrm{H} & & \\ & & \mathrm{O} & & \\ & & | & & \\ \mathrm{HO} & - & \mathrm{Al} & - & \mathrm{OH} \end{array}$$

13



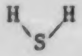
$$\begin{array}{ccccccccc} & & \mathrm{H} & & \mathrm{H} & & \mathrm{H} & & \\ & & \mathrm{O} & & \mathrm{O} & & \mathrm{O} & & \\ & & | & & | & & | & & \\ \mathrm{H} & - & \mathrm{C} & - & \mathrm{C} & - & \mathrm{C} & - & \mathrm{H} \\ & & | & & | & & | & & \\ & & \mathrm{H} & & \mathrm{H} & & \mathrm{H} & & \end{array}$$

14

H-S-H

15

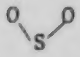
TGT WORKSHEET: I.13 Organic and Inorganic Formulas



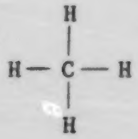
16

Na-Cl

17



18

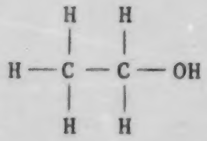


$$\begin{array}{ccccc} & & H & & \\ & & | & & \\ H & - & C & - & H \\ & & | & & \\ & & H & & \end{array}$$

19

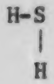
O-O

20



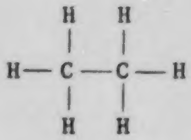
$$\begin{array}{ccccccc} & & H & & H & & \\ & & | & & | & & \\ H & - & C & - & C & - & OH \\ & & | & & | & & \\ & & H & & H & & \end{array}$$

21



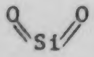
$$\begin{array}{l} H-S \\ \;\;\;| \\ \;\;\;H \end{array}$$

22

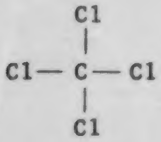


$$\begin{array}{ccccccc} & & H & & H & & \\ & & | & & | & & \\ H & - & C & - & C & - & H \\ & & | & & | & & \\ & & H & & H & & \end{array}$$

23



24



$$\begin{array}{ccccc} & & Cl & & \\ & & | & & \\ Cl & - & C & - & Cl \\ & & | & & \\ & & Cl & & \end{array}$$

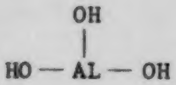
25

Cu-S

26

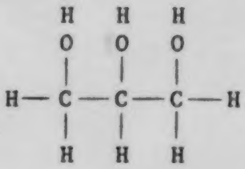
K-I

27



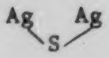
$$\begin{array}{ccccc} & & OH & & \\ & & | & & \\ HO & - & AL & - & OH \end{array}$$

28



$$\begin{array}{ccccccccc} & & H & & H & & H & & \\ & & O & & O & & O & & \\ & & | & & | & & | & & \\ H & - & C & - & C & - & C & - & H \\ & & | & & | & & | & & \\ & & H & & H & & H & & \end{array}$$

29



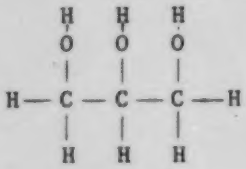
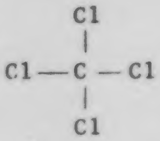
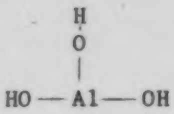
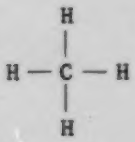
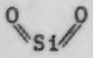
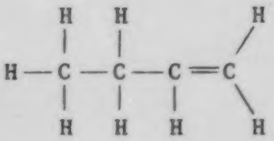
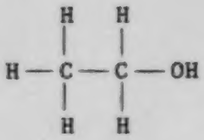
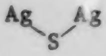
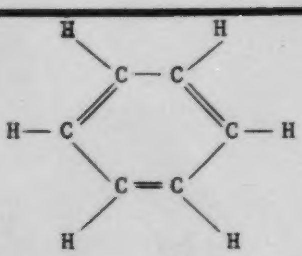
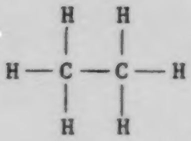
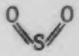
30

WORKSHEET ANSWERS

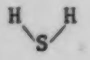
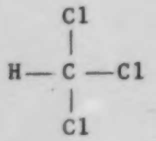
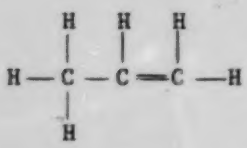
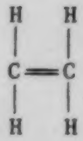
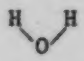
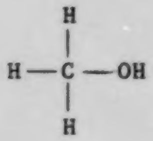
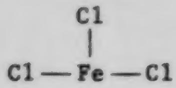
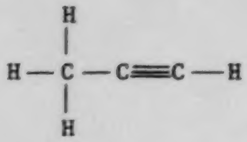
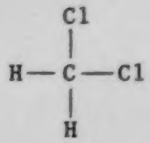
I.13 Organic and Inorganic Formulas

1. NaCl
2. H_2O
3. CO_2
4. CCl_4
5. CuS
6. C_2H_6
7. SiO_2
8. C_2H_5OH
9. KI
10. CH_4
11. O_2
12. Ag_2S
13. $Al(OH)_3$
14. $C_3H_5OH_3$
15. H_2S
16. inorganic
17. inorganic
18. inorganic
19. organic
20. inorganic
21. organic
22. inorganic
23. organic
24. inorganic
25. organic
26. inorganic
27. inorganic
28. inorganic
29. organic
30. inorganic

TGT GAMESHEET: I.13 Organic and Inorganic Formulas

H-Cl 1	 $\begin{array}{ccccccc} & H & & H & & H & \\ & O & & O & & O & \\ & \vert & & \vert & & \vert & \\ H- & C & - & C & - & C & -H \\ & \vert & & \vert & & \vert & \\ & H & & H & & H & \end{array}$ 2	 $\begin{array}{ccc} & Cl & \\ & \vert & \\ Cl- & C & -Cl \\ & \vert & \\ & Cl & \end{array}$ 3
Na-OH 4	K-Cl 5	 $\begin{array}{ccc} & H & \\ & O & \\ & \vert & \\ HO- & Al & -OH \end{array}$ 6
 $\begin{array}{ccc} & H & \\ & \vert & \\ H- & C & -H \\ & \vert & \\ & H & \end{array}$ 7	 8	 9
 $\begin{array}{ccccc} & H & & H & \\ & \vert & & \vert & \\ H- & C & - & C & -OH \\ & \vert & & \vert & \\ & H & & H & \end{array}$ 10	Cu-S 11	 12
 13	 $\begin{array}{ccccc} & H & & H & \\ & \vert & & \vert & \\ H- & C & - & C & -H \\ & \vert & & \vert & \\ & H & & H & \end{array}$ 14	 15

TGT GAMESHEET: I.13 Organic and Inorganic Formulas

 16	$K-OH$ 17	 $H-\overset{Cl}{\underset{Cl}{C}}-Cl$ 18
 $H-\overset{H}{\underset{H}{C}}-\overset{H}{C}=\overset{H}{C}-H$ 19	$Na-Cl$ 20	 $\overset{H}{\underset{H}{C}}=\overset{H}{\underset{H}{C}}$ 21
 22	 $H-\overset{H}{\underset{H}{C}}-OH$ 23	$K-I$ 24
 $Cl-\overset{Cl}{Fe}-Cl$ 25	 $H-\overset{H}{\underset{H}{C}}-C\equiv C-H$ 26	 $H-\overset{Cl}{\underset{H}{C}}-Cl$ 27
$Mg=O$ 28	$I-Ca-I$ 29	$H-C\equiv C-H$ 30

GAMESHEET ANSWERS

I.13 Organic and Inorganic Formulas

1. inorganic HCl
2. organic $C_3H_5(OH)_3$
3. organic CCl_4
4. inorganic $NaOH$
5. inorganic $K-Cl$
6. inorganic $Al(OH)_3$
7. organic CH_4
8. inorganic SiO_2
9. organic C_4H_8
10. organic C_2H_5OH
11. inorganic CuS
12. inorganic Ag_2S
13. organic C_6H_6
14. organic C_2H_6
15. inorganic SO_2
16. inorganic H_2S
17. inorganic KOH
18. organic $CHCl_3$
19. organic C_3H_6
20. inorganic $NaCl$
21. organic C_2H_4
22. inorganic H_2O
23. organic CH_3OH
24. inorganic KI
25. inorganic $FeCl_3$
26. organic C_3H_4
27. organic CH_2Cl_2
28. inorganic MgO
29. inorganic CaI_2
30. organic C_2H_2

TGT PHYSICAL SCIENCE

UNIT: Chemistry

WORKSHEET: Chemistry Vocabulary Review

Objective: I.14--Students will define chemistry unit terms.

Instructions: This worksheet will help you prepare for the Chemistry Vocabulary Review Game. In items 1-15, choose the correct answer from the choices provided. In items 16-29, read the definition and unscramble the underlined word which is defined. Refer to the vocabulary list below to help you with items 16-29. In the tournament game, you will be asked to read a statement to determine if it is true or false. If it is false you must replace the underlined word with the correct answer.

Vocabulary:

- atom
- atomic weight or mass number
- atomic number
- apparatus
- compound
- crystals
- electron
- electron cloud
- equation
- energy level
- formula
- metal
- mixture
- molecule
- nucleus
- neutron
- non-metal
- orbit
- periodic table
- precipitate
- proton
- radical ion
- scientific law
- solute
- solution
- solvent
- suspension
- symbol
- theory

TGT WORKSHEET: I.14 Chemistry Vocabulary Review

Elements that gain electrons when interacting chemically with other elements.

a) metals
b) noble gases
c) non-metals

1

A solute dissolved in a solvent forms a(n) ________.

a) compound
b) element
c) suspension
d) solution

2

A mixture containing particles of insoluble material too tiny to settle to the bottom, yet big enough to make the liquid look muddy or milky instead of clear.

a) suspension c) precipitate
b) solution d) compound

3

A chemical reaction expressed with chemical symbols.

a) element
b) compound
c) equation
d) formula

4

The name of the particle of an element that takes part in a chemical reaction.

a) atom
b) electron
c) molecule
d) proton

5

A substance formed by the chemical combination of two or more elements.

a) element
b) compound
c) mixture
d) solution

6

A positively charged particle found in the nucleus of an atom.

a) orbit
b) electron
c) neutron
d) proton

7

The smallest particle of a substance still having the chemical properties of that substance.

a) atom
b) electron
c) molecule
d) proton

8

One or two letters which represent an element.

a) formula
b) symbol
c) equation

9

An element that gives up its electrons when interacting chemically with other elements.

a) metal
b) noble gas
c) non-metal

10

The part of the atom that contains the protons and neutrons.

a) electron cloud
b) the hub
c) the nucleus
d) orbit

11

An ion composed of two or more atoms that acts as a single unit in chemical interactions.

a) element
b) compound
c) mixture
d) radical

12

A particle outside the nuclei of atoms with a negative charge.

a) electron
b) proton
c) neutron
d) orbit

13

An insoluble substance that forms during a chemical reaction.

a) solvent
b) solute
c) noble gas
d) precipitate

14

Two or more chemical substances combined physically.

a) element
b) compound
c) mixture
d) solution

15

TGT WORKSHEET: I.14 Chemistry Vocabulary Review

A particle in the atomic nucleus that has no electrical charge and is equal in mass to the proton. NTRONEU 16	The path an electron takes in its movements around the nucleus of an atom. BROTI 17	An object whose atoms and molecules have a definite arrangement. RYCTALS 18
A space around the nucleus of an atom, showing the general location of electrons. HSLLE 19	A machine or piece of equipment. ARAPTASUP 20	The MICTAO BERNUM of an element is equal to the number of protons in the nucleus of an atom. 21
An arrangement of chemical symbols and numbers that shows the number and kinds of atoms in a compound. RMFOLAU 22	The amount of energy which electrons have in a given shell around the nucleus of the atom. GYENER LELEV 23	The arrangement of the elements in the order of their atomic numbers. IODPERIC BLETA 24
The MICTAO EIWGTH of an element is approximately equal to the sum of the masses of the protons and neutrons in the nucleus of an atom. 25	A substance, usually a liquid, that will dissolve a solute. TNEVLOS 26	An explanation backed up by many experiments; an explanation that seems to work most of the time; a generalization. TIFSCIENIC AWL 27
An explanation based on some facts; to be tested again and again by experiment. HEOTRY 28	The substance that will dissolve in a solvent; to form a solution. SOETLU 29	

WORKSHEET ANSWERS

I.14 Chemistry Vocabulary Review

1. c) non-metal
2. d) solution
3. a) suspension
4. c) equation
5. a) atom
6. b) compound
7. d) proton
8. c) molecule
9. b) symbol
10. a) metal
11. c) nucleus
12. d) radical
13. a) electron
14. d) precipitate
15. c) mixture
16. neutron
17. orbit
18. crystal
19. shell
20. apparatus
21. atomic number
22. formula
23. energy level
24. periodic table
25. atomic weight
26. solvent
27. scientific law
28. theory
29. solute

TGT GAMESHEET: I.14 Chemistry Vocabulary Review

The smallest particle of a substance still having the chemical properties of that substance is an atom.

True-False __________

1

A theory is an explanation based on some facts; to be tested again and again by experiment.

True-False __________

2

An element that gives up its electrons when interacting chemically with other elements is classified as a non-metal.

True-False __________

3

An arrangement of chemical symbols and numbers that shows the number and kinds of atoms in a compound is called a formula.

True-False __________

4

A compound is a substance formed by the chemical combination of two or more elements.

True-False __________

5

A chemical equation is an expression that tells by formula and symbols what happens during a chemical reaction.

True-False __________

6

Two or more chemical substances combined physically is called a compound.

True-False __________

7

The atomic weight of an element is equal to the number of protons in the nucleus of an atom.

True-False __________

8

A mixture containing particles of insoluble material too tiny to settle to the bottom, yet big enough to make the liquid look muddy or milky instead of clear is called a suspension.

True-False __________

9

The atomic number of an element is approximately equal to the sum of the masses of the protons and neutrons in the nucleus of an atom.

True-False __________

10

The amount of energy which electrons have in a given shell around the nucleus of the atom is the energy level.

True-False __________

11

A solvent is a substance, usually a liquid, that will dissolve a solute.

True-False __________

12

An electron is a particle in the atomic nucleus that has no electrical charge and is equal in mass to the proton.

True-False __________

13

A proton is a positively charged particle found in the nucleus of an atom.

True-False __________

14

The precipitate is the substance that will dissolve in a solvent; to form a solution.

True-False __________

15

TGT GAMESHEET: I.14 Chemical Vocabulary Review

The atom is the particle of an element that takes part in a chemical reaction.

True-False __________

16

One or two letters which represent an element is called a formula.

True-False __________

17

A solid whose atoms or molecules have a definite arrangement is called a crystal.

True-False __________

18

An orbit is the path an electron takes in its movements around the nucleus of an atom.

True-False __________

19

A shell is the space around the nucleus of an atom, showing the general location of electrons.

True-False __________

20

Elements that gain electrons when interacting chemically with other elements are classified as metals.

True-False __________

21

An ion composed of two or more atoms that acts as a single unit in chemical interactions is called a compound.

True-False __________

22

A solution is a mixture of a solute dissolved in a solvent.

True-False __________

23

The arrangement of the elements in the order of their atomic numbers is called the periodic table.

True-False __________

24

The part of the atom that contains the protons and neutrons is called the hub.

True-False __________

25

A machine or piece of equipment is called an apparatus.

True-False __________

26

A scientific law is an explanation backed up by many experiments; an explanation that seems to work most of the time; a generalization.

True-False __________

27

A particle outside the nucleu of atoms with a negative charge is called a neutron.

True-False __________

28

An insoluble substance that forms during a chemical reaction is called the solute.

True-False __________

29

GAMESHEET ANSWERS

I.14 Chemistry Vocabulary Review

1. False, molecule
2. True
3. False, metal
4. True
5. True
6. True
7. False, mixture
8. False, atomic number
9. True
10. False, atomic weight (mass number)
11. True
12. True
13. False, neutron
14. True
15. False, solute
16. True
17. False, symbol
18. True
19. True
20. True
21. False, non-metals
22. False, radical
23. True
24. True
25. False, nucleus
26. True
27. True
28. False, electron
29. False, precipitate

TGT PHYSICAL SCIENCE

UNIT: Work, Force and Motion

WORKSHEET: Simple Machines

Objective: II.1--a. Students will identify practical examples of levers.

b. Students will compute the IMA, AMA, and efficiency of a lever system by applying the formulas.

Instructions: This worksheet will help you prepare for the Simple Machines Game. In numbers 1-15, use the information found on the diagram sheet and answer the questions. In numbers 16-30, identify the picture as a 1st, 2nd or 3rd class lever.

Vocabulary:

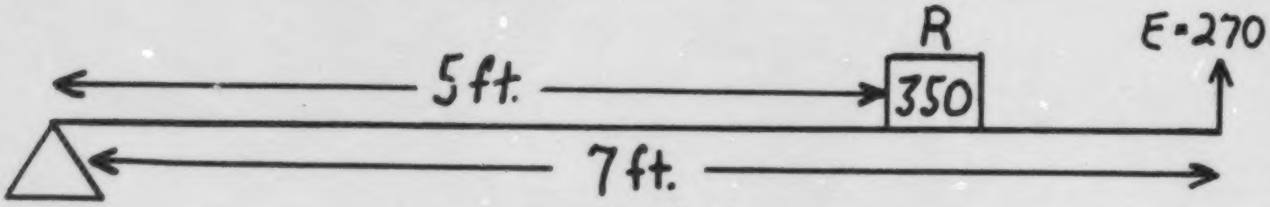
actual mechanical advantage (AMA)
efficiency
effort arm
fulcrum
ideal mechanical advantage (IMA)
resistance
resistance arm

Example

Formulas: $\text{IMA} = \dfrac{\text{Effort Arm}}{\text{Resistance Arm}} = \dfrac{7}{5} = 1.4$

$\text{AMA} = \dfrac{\text{Resistance}}{\text{Effort}} = \dfrac{350}{270} = 1.3$

$\text{Efficiency} = \dfrac{\text{AMA}}{\text{IMA}} = \dfrac{1.3}{1.4} = .9$


R
350
E=270
5 ft.
7 ft.

Use these diagrams to solve the worksheet problems.

Diagram A

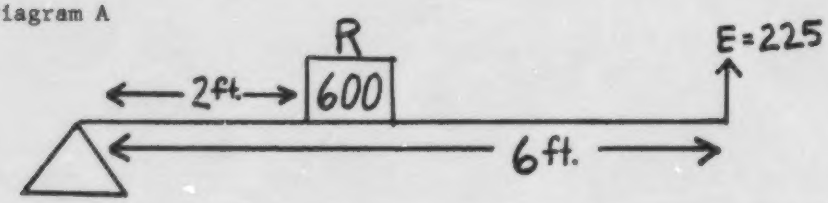

R
600
E=225
2 ft.
6 ft.

Diagram B

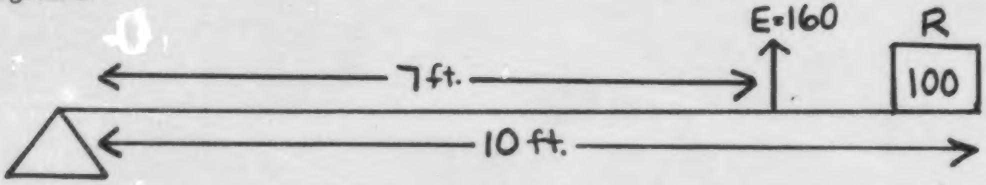
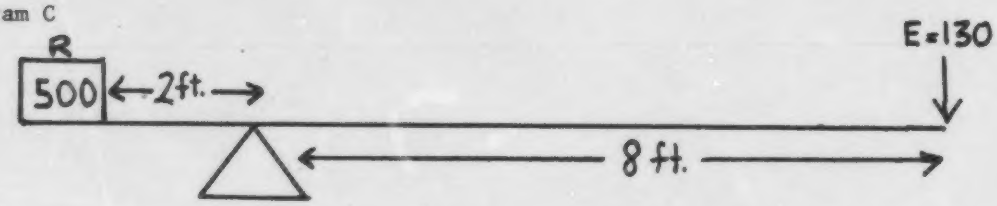

E=160
R
100
7 ft.
10 ft.

Diagram C


R
500
2 ft.
E=130
8 ft.

TGT WORKSHEET: II.1 Simple Machines

In diagram A the lever is:

a. 1st class
b. 2nd class
c. 3rd class

1

In diagram A the IMA is:

a. 3
b. 4
c. 2

2

In diagram A the AMA is:

a. 3
b. 3.2
c. 2.7

3

In diagram A the efficiency is:

a. 1
b. .6
c. .9

4

In diagram B the lever is:

a. 1st class
b. 2nd class
c. 3rd class

5

In diagram B the IMA is:

a. 1.3
b. .7
c. .5

6

In diagram B the AMA is:

a. .6
b. 1.6
c. .5

7

In diagram B the efficiency is:

a. 1
b. .8
c. 1.3

8

In diagram C the lever is:

a. 1st class
b. 2nd class
c. 3rd class

9

In diagram C the IMA is:

a. 2
b. 3
c. 4

10

In diagram C the AMA is:

a. 3.8
b. 4.2
c. 3.5

11

In diagram C the efficiency is:

a. 1.2
b. .6
c. .9

12

The efficiency of a lever will:

a. never be greater than 1
b. equal 1
c. be greater than 1

13

In diagram A, if the effort arm was increased to 8 ft., the amount of effort needed would:

a. increase
b. decrease
c. stay the same

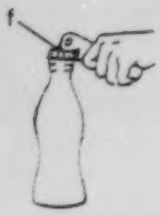
14

In diagram C, if the resistance arm was changed to 4, the effort needed would:

a. increase
b. decrease
c. stay the same

15

16



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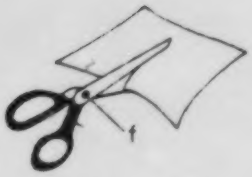

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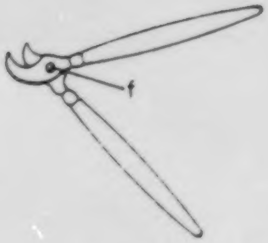

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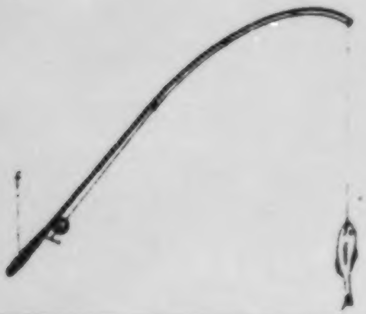

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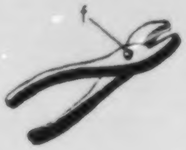

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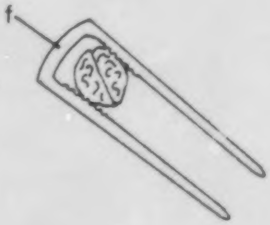

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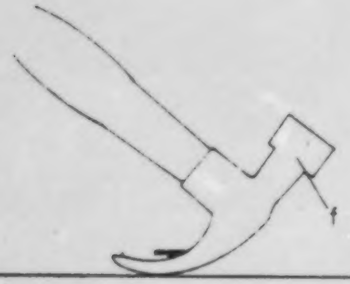

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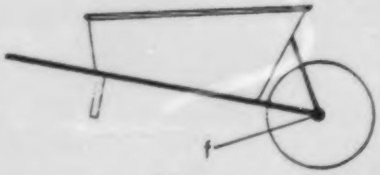

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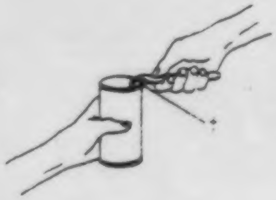

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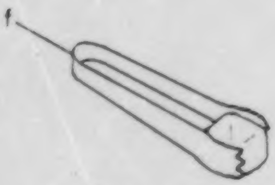

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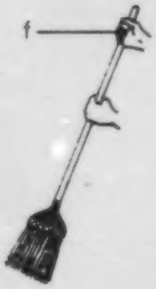

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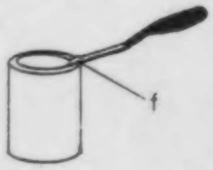

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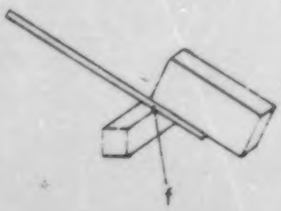

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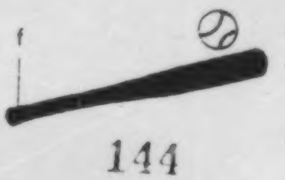

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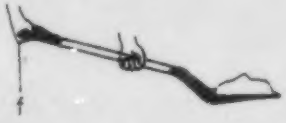


WORKSHEET ANSWERS

II.1 Simple Machines

1. b) 2nd class
2. a) 3
3. c) 2.7
4. c) .9
5. c) 3rd class
6. b) .7
7. a) .6
8. b) .8
9. a) 1st class
10. c) 4
11. a) 3.8
12. c) .9
13. a) never greater than 1
14. b) decrease
15. a) increase
16. 2nd
17. 1st
18. 1st
19. 3rd
20. 1st
21. 2nd
22. 1st
23. 2nd
24. 1st
25. 3rd
26. 3rd
27. 1st
28. 1st
29. 3rd
30. 2nd

For Use with Gamesheet II.1

Diagram A

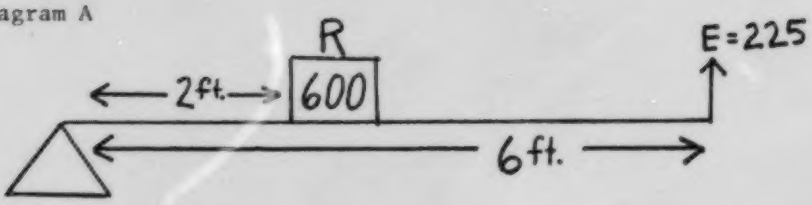

R
600
2 ft.
E=225
6 ft.

Diagram B

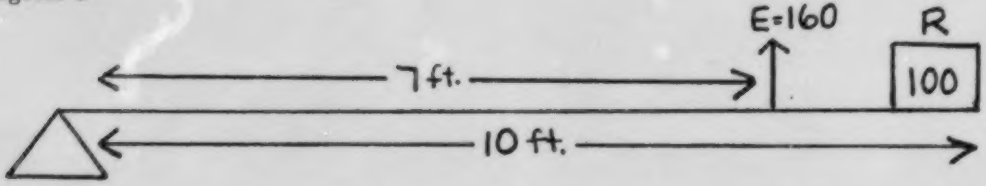
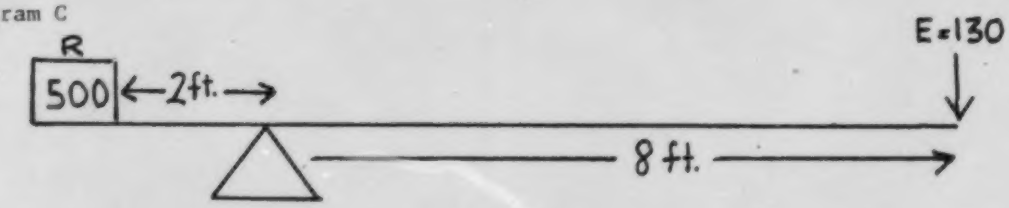

E=160
R
100
7 ft.
10 ft.

Diagram C


R
500
2 ft.
E=130
8 ft.

TGT GAMESHEET: II.1 Simple Machines

In diagram A the lever is:

a. 1st class
b. 2nd class
c. 3rd class

1

In diagram A the IMA is:

a. 3
b. 4
c. 2

2

In diagram A the AMA is:

a. 3
b. 3.2
c. 2.2

3

In diagram A the efficiency is:

a. 1
b. .5
c. .7

4

In diagram B the lever is:

a. 1st class
b. 2nd class
c. 3rd class

5

In diagram B the IMA is:

a. 1.3
b. .6
c. .5

6

In diagram B the AMA is:

a. .5
b. 1.6
c. .7

7

In diagram B the efficiency is:

a. 1
b. .8
c. .5

8

In diagram C the lever is:

a. 1st class
b. 2nd class
c. 3rd class

9

In diagram C the IMA is:

a. 2
b. 3
c. 4

10

In diagram C the AMA is:

a. 3.2
b. 4.2
c. 3.8

11

In diagram C the efficiency is:

a. 1
b. .6
c. .8

12

The efficiency of a lever will:

a. never be greater than 1
b. equal 1
c. be greater than 1

13

In diagram A, if the effort arm was increased to 10 ft., the amount of effort needed would:

a. increase
b. decrease
c. stay the same

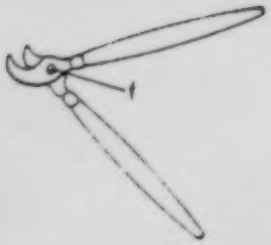
14

In diagram C, if the resistance arm was changed to 4, the effort needed would:

a. increase
b. decrease
c. stay the same

15

16



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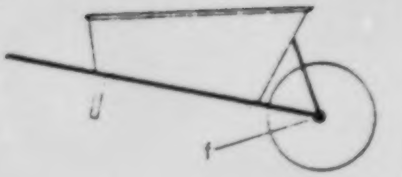

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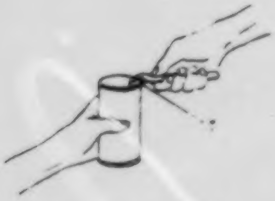

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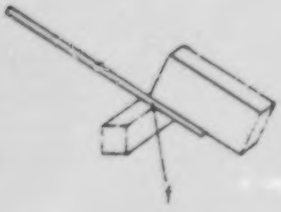

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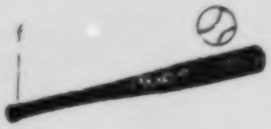

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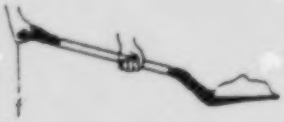

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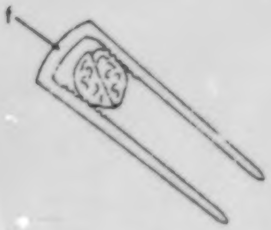

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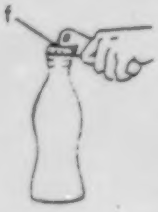

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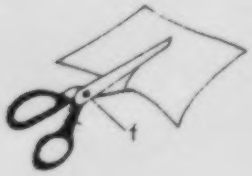

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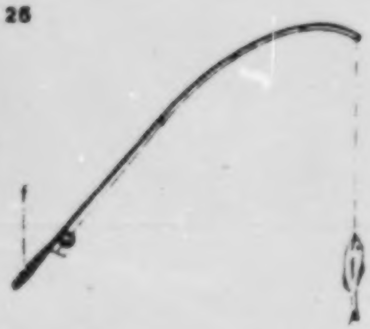

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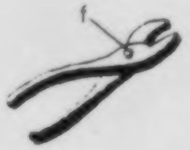

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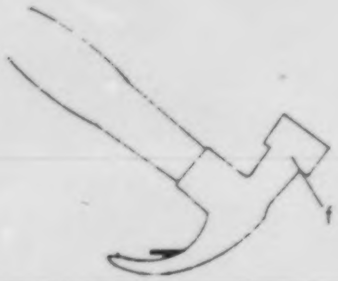

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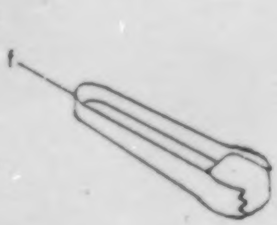

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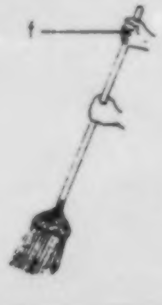

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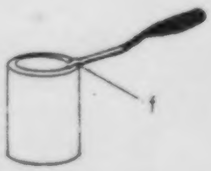


GAMESHEET ANSWERS

II.1 Simple Machines

1. b) 2nd class
2. a) 3
3. c) 2.2
4. c) .7
5. c) 3rd class
6. b) .6
7. a) .5
8. b) .8
9. a) 1st class
10. c) 4
11. a) 3.2
12. c) .8
13. a) never greater than 1
14. b) decrease
15. a) increase
16. 1st
17. 2nd
18. 1st
19. 1st
20. 3rd
21. 2nd
22. 2nd
23. 2nd
24. 1st
25. 3rd
26. 1st
27. 1st
28. 3rd
29. 3rd
30. 1st

TGT PHYSICAL SCIENCE

UNIT: Work, Force and Motion

WORKSHEET: Ideal Mechanical Advantage (IMA)

Objective: II.2--a. Students will compute the IMA of simple mechines.

b. Students will match IMA formulas with the proper machine.

c. Students will identify factors that affect the IMA of a simple machine.

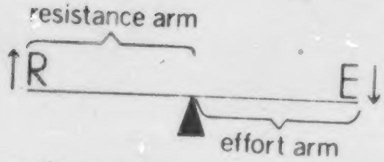
Instructions: This worksheet will help you prepare for the Ideal Mechanical Advantage Game. In questions 1-10, read the statement and choose the correct answer. In questions 11-30, look at the diagram and choose the correct IMA. A formula and example sheet is provided for the practice session only, not for the tournament.

Vocabulary:

effort force
formula
friction
fulcrum
inclined plane
pulley
resistance force
wheel and axle

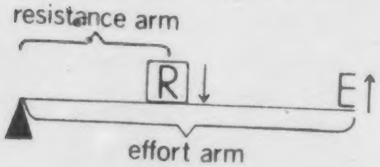
Formulas and Examples

1. Levers
   1st class


resistance arm
R
E
effort arm

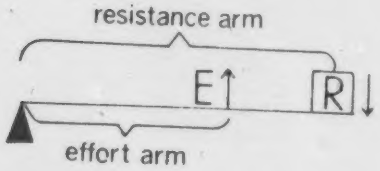
$IMA = \frac{\text{Effort Arm}}{\text{Resistance Arm}}$

2nd class


resistance arm
R
E
effort arm

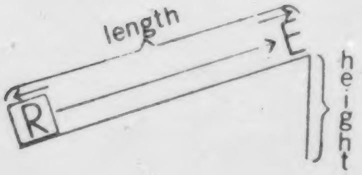
$IMA = \frac{\text{Effort Arm}}{\text{Resistance Arm}}$

3rd class


resistance arm
E
R
effort arm

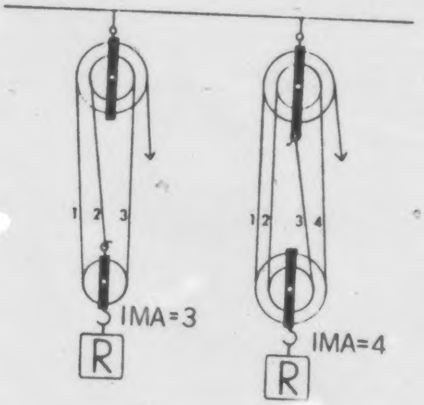
$IMA = \frac{\text{Effort Arm}}{\text{Resistance Arm}}$

2. Inclined Plane


length
E
R
height

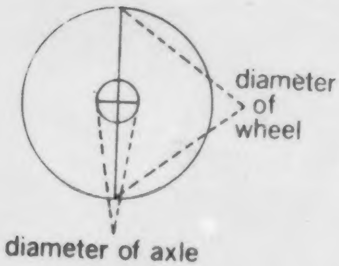
$IMA = \frac{L}{H}$ $\frac{\text{(length)}}{\text{(height)}}$

3. Pulley


1 2 3
IMA=3
R
1 2 3 4
IMA=4
R

IMA = The number of strands supporting the moveable pulley.

4. Wheel and Axle


diameter of wheel
diameter of axle

$IMA = \frac{\text{Diameter of wheel}}{\text{Diameter of axle}}$

TGT WORKSHEET: II. 2 IMA (Ideal Mechanical Advantage)

The IMA of a lever is found by

a) $\frac{\text{Resistance}}{\text{Effort}}$

b) $\frac{\text{Effort Arm}}{\text{Resistance Arm}}$

c) $\frac{\text{Resistance Arm}}{\text{Effort Arm}}$

1

The __________ class lever cannot have an IMA of less than 1.

a) 1st

b) 2nd

c) 3rd

2

The IMA of an inclined plane is found by using the formula

a) $\frac{L}{H}$

b) H x L

c) $\frac{H}{L}$

3

If the IMA of a machine is 4, how much effort will it take to lift 100 lb?

a) 200 lb

b) 100 lb

c) 50 lb.

d) 25 lb

4

If the IMA of a machine decreases it will take ______ effort to lift 100 lb.

a) more

b) the same

c) less

5

If the IMA of a machine is 1, how much effort will it take to lift 100 lb?

a) 200 lb

b) 150 lb

c) 50 lb

d) 100 lb

6

If the IMA of a machine is 2, how much effort will it take to lift 100 lb?

a) 200 lb

b) 100 lb

c) 50 lb

d) 25 lb

7

If the IMA is .5, how much effort will it take to lift 100 lb?

a) 200 lb

b) 100 lb

c) 50 lb

d) 25 lb

8

Due to _________ the HMA will always differ from the IMA.

a) gravity

b) friction

c) inertia

9

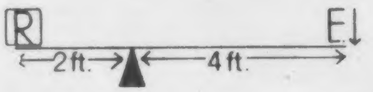
The IMA of a _______ class lever can never be greater than 1.

a) 1st

b) 2nd

c) 3rd

10



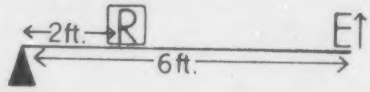
a) 4

b) .5

c) 1

d) 2

11



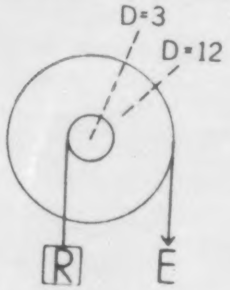
a) 3

b) 2

c) 4

d) 5

12



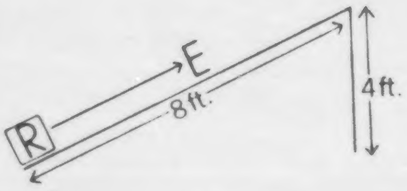
a) 3

b) 2

c) 4

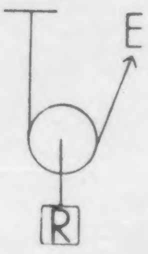
d) 1

13



a) 3 b) 2 c) 4 d) 5

14



a) 3

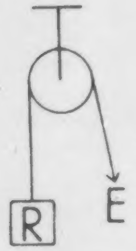
b) 2

c) 4

d) 1

15

TGT WORKSHEET: II.2 IMA (Ideal Mechanical Advantage)



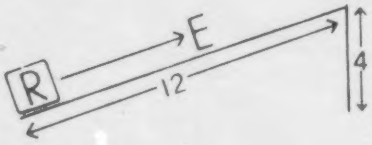
a) 1

b) 2

c) 3

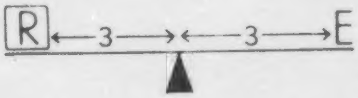
d) 4

16



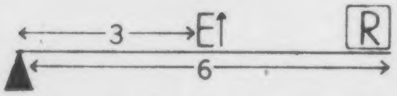
a) 1 b) 2 c) 3 d) 4

17



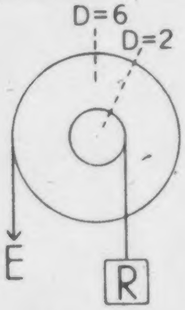
a) 3 b) 5 c) 0 d) 1

18



a) 1 b) 2 c) 3 d) 4

19



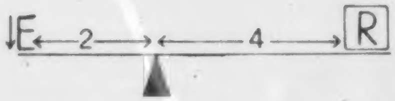
a) 1

b) 2

c) 3

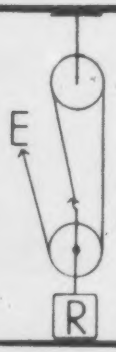
d) 4

20



a) 2 b) .5 c) 3 d) 1

21



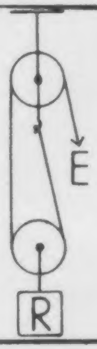
a) 2

b) .5

c) 3

d) 4

22



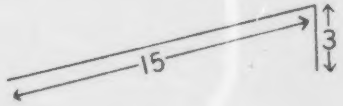
a) 2

b) .5

c) 3

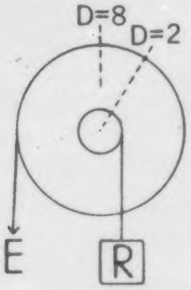
d) 1

23



a) 6 b) 4 c) 3 d) 5

24



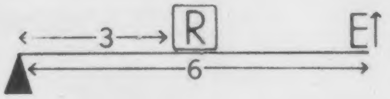
a) 5

b) 4

c) 3

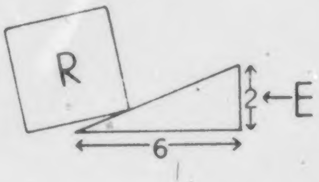
d) 2

25



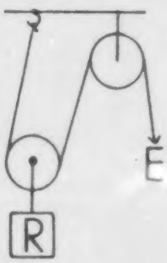
a) 2 b) .5 c) 3 d) 4

26



a) 3 b) 2 c) 6 d) 4

27



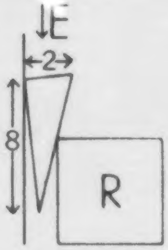
a) 4

b) 1

c) 3

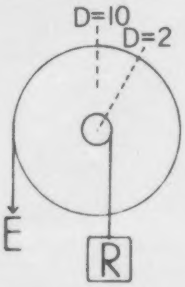
d) 2

28



a) 4 b) 8 c) 2 d) 6

29



a) 2

b) 5

c) 4

d) 5

30

WORKSHEET ANSWERS

II.2 IMA (Ideal Mechanical Advantage)

1. (b) $\frac{\text{Effort Arm}}{\text{Resistance Arm}}$
2. (b) 2nd
3. (a) $\frac{L}{H}$
4. (d) 25 lb
5. (a) more
6. (d) 100 lb
7. (c) 50 lb
8. (a) 200 lb
9. (b) friction
10. (c) 3rd
11. (d) 2
12. (a) 3
13. (c) 4
14. (b) 2
15. (b) 2
16. (a) 1
17. (c) 3
18. (d) 1
19. (b) 2
20. (c) 3
21. (b) .5
22. (c) 3
23. (a) 2
24. (d) 5
25. (b) 4
26. (a) 2
27. (a) 3
28. (d) 2
29. (a) 4
30. (b) 5

TGT GAMESHEET: II.2 IMA (Ideal Mechanical Advantage)

The IMA of an inclined plane is found by using the formula

a) $\frac{L}{H}$

b) H x L

c) $\frac{H}{L}$

1

The IMA of a lever is found by

a) $\frac{\text{Resistance}}{\text{Effort}}$

b) $\frac{\text{Effort Arm}}{\text{Resistance Arm}}$

c) $\frac{\text{Resistance Arm}}{\text{Effort Arm}}$

2

The _______ class lever cannot have an IMA of less than 1.

a) 1st

b) 2nd

c) 3rd

3

If the IMA of a machine is 1, how much effort will it take to lift 100 lb?

a) 200 lb

b) 100 lb

c) 50 lb

d) 25 lb

4

If the IMA of a machine is 2, how much effort will it take to lift 100 lb?

a) 200 lb

b) 100 lb

c) 50 lb

d) 25 lb

5

If the IMA of a machine decreases it will take __________ effort to lift 100 lb.

6

Due to _______ the HMA will always differ from the IMA.

a) gravity

b) friction

c) inertia

7

If the IMA of a machine is 4, how much effort will it take to lift 100 lb?

a) 200 lb

b) 100 lb

c) 50 lb

d) 25 lb

8

If the IMA is .5, how much effort will it take to lift 100 lb?

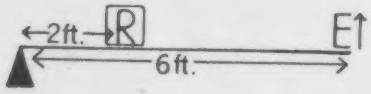
a) 200 lb

b) 100 lb

c) 50 lb

d) 25 lb

9



a) 3 c) 4

b) 2 d) 5

10

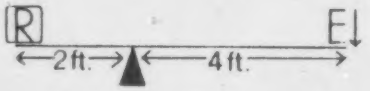
The IMA of a ______ class lever can never be greater than 1.

a) 1st

b) 2nd

c) 3rd

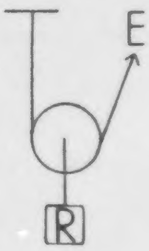
11



a) 4 c) 5

b) .5 d) 2

12



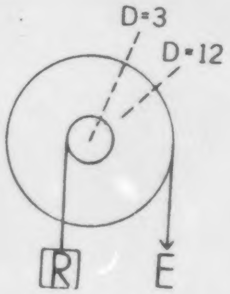
a) 3

b) 2

c) 4

d) 1

13



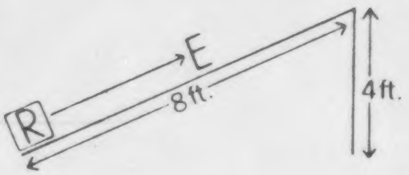
a) 3

b) 2

c) 4

d) 1

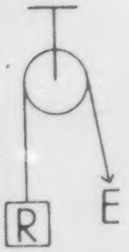
14



a) 3 b) 2 c) 4 d) 1

15

TGT GAMESHEET: II.2 IMA (Ideal Mechanical Advantage)



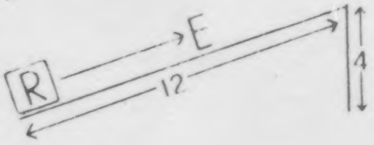
a) 4

b) 2

c) 3

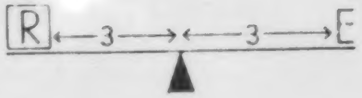
d) 1

16



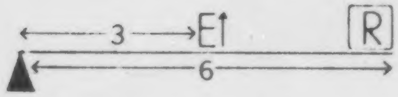
a) 1 b) 2 c) 3 d) 4

17



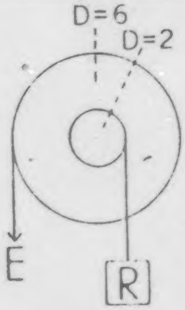
a) 1 b) 2 c) 3 d) 4

18



a) 4 b) 3 c) 2 d) 1

19



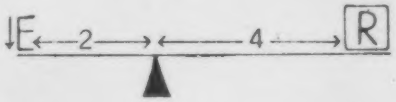
a) 4

b) 3

c) 2

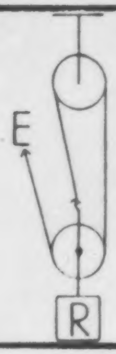
d) 1

20



a) 4 b) 3 c) 2 d) .5

21



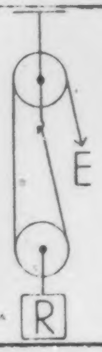
a) 2

b) .5

c) 3

d) 4

22



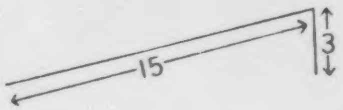
a) 2

b) .5

c) 3

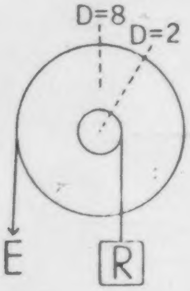
d) 4

23



a) 5 b) 4 c) 3 d) .5

24



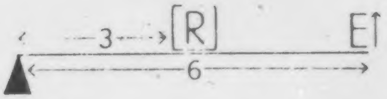
a) 2

b) 3

c) 4

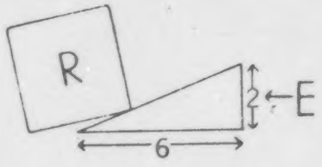
d) 5

25



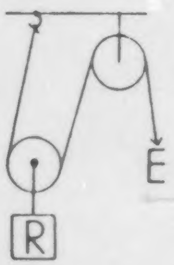
a) 2 b) .5 c) 3 d) 4

26



a) 2 b) 4 c) 6 d) 3

27



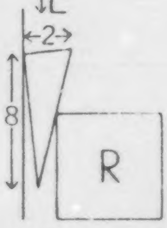
a) 1

b) 2

c) 3

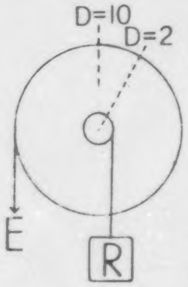
d) 4

28



a) 5 b) 4 c) 3 d) 2

29



a) 2

b) 3

c) 4

d) 5

30

GAMESHEET ANSWERS

II.2 IMA (Ideal Mechanical Advantage)

1. (a) $\frac{L}{H}$
2. (b) $\frac{\text{Effort Arm}}{\text{Resistance Arm}}$
3. (b) 2nd
4. (b) 100 lb
5. (c) 50 lb
6. (a) more
7. (b) friction
8. (d) 25 lb
9. (a) 200 lb
10. (a) 3
11. (c) 3rd
12. (d) 2
13. (b) 2
14. (c) 4
15. (b) 2
16. (d) 1
17. (c) 3
18. (a) 1
19. (c) 2
20. (b) 3
21. (d) .5
22. (c) 3
23. (a) 2
24. (a) 5
25. (c) 4
26. (a) 2
27. (d) 3
28. (b) 2
29. (b) 4
30. (d) 5

TGT PHYSICAL SCIENCE

UNIT: Work, Force and Motion

WORKSHEET: Laws and Principles of Motion

Objective: II.3--Students will be able to apply Newton's laws of motion and Bernoulli's principle to practical events.

Instructions: This worksheet will help you prepare for the Laws and Principles of Motion Game. Read each statement carefully and determine which of the following would apply:

Newton's 1st law of motion: A body remains at rest unless a force makes it move. A force is required to change the speed or direction of a moving body.

Newton's 2nd law of motion: Acceleration of a body increases as the amount of force producing the acceleration increases. The larger the mass of the body, the larger the force needed to produce acceleration.

Newton's 3rd law of motion: For every force, there is an equal and opposite force.

Bernoulli's principle: As the speed of a fluid increases, the pressure around it decreases.

acceleration
force
inertia
mass

TGT WORKSHEET: II.3 Laws and Principles of Motion

Seat belts are needed in a car.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

1

A rocket ship being launched.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

2

A baseball curving.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

3

A shotgun kicking when it is fired.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

4

A drag chute being used to stop a racing car.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

5

The farther back you pull a bow string, the farther the arrow travels.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

6

A golf ball hooking.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

7

A cannon moves back as a shell is fired from it.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

8

The need for a head rest in a car.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

9

A car is moving at a high rate of speed. A window is opened and papers fly out of the car.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

10

The movement of a rotating lawn sprinkler.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

11

An electric paint spraying outfit.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

12

It takes more force to move a loaded wagon than it does to move an empty wagon.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

13

The shape of an airplane wing.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

14

A boy jumps to a dock from a boat. The boat moves away from the dock.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

15

TGT WORKSHEET: II.3 Laws and Principles of Motion

It is more difficult to get a car to move than it is to keep it moving.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

16

An atomizer.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

17

It takes more force to push a truck than it does a car.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

18

The action of a vacuum cleaner.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

19

The movement produced when paddling a canoe.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

20

A bus stops quickly and a person standing falls forward.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

21

A ball suspended by a stream of air.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

22

An air foil on a racing car.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

23

A horse stops quickly and the rider falls over his head.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

24

WORKSHEET ANSWERS

II.3 Laws and Principles of Motion

1. a) Newton's 1st law
2. c) Newton's 3rd law
3. d) Bernoulli's principle
4. c) Newton's 3rd law
5. a) Newton's 1st law
6. b) Newton's 2nd law
7. d) Bernoulli's principle
8. c) Newton's 3rd law
9. a) Newton's 1st law
10. d) Bernoulli's principle
11. c) Newton's 3rd law
12. d) Bernoulli's principle
13. b) Newton's 2nd law
14. d) Bernoulli's principle
15. c) Newton's 3rd law
16. a) Newton's 1st law
17. d) Bernoulli's principle
18. b) Newton's 2nd law
19. d) Bernoulli's principle
20. c) Newton's 3rd law
21. a) Newton's 1st law
22. d) Bernoulli's principle
23. d) Bernoulli's principle
24. a) Newton's 1st law

TGT GAMESHEET: II.3 Laws and Principles of Motion

Seat belts are needed in a car.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

1

A baseball curving.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

2

An air foil on a racing car.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

3

A shotgun kicking when it is fired.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

4

The farther back you pull a bow string, the farther the arrow travels.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

5

It takes more force to push a truck than it does a car.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

6

A golf ball hooking.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

7

The need for a head rest in a car.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

8

A bus stops quickly and a person standing falls forward.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

9

A car is moving at a high rate of speed. A window is opened and papers fly out of the window.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

10

An electric air paint spraying outfit.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

11

A horse stops quickly and the rider falls over his head.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

12

It takes more force to move a loaded wagon than it does to move an empty wagon.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

13

A boy jumps to a dock from a boat. The boat moves away from the dock.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

14

A rocket ship being launched.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

15

TGT GAMESHEET: II.3 Laws and Principles of Motion

It is more difficult to get a car to move than it is to keep it moving.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

16

A drag chute being used to stop a racing car.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

17

The action of a vacuum cleaner.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

18

A cannon moves back as a shell is fired from it.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

19

A ball supported by a stream of air.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

20

The movement of a rotating lawn sprinkler.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

21

An atomizer.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

22

The shape of an airplane wing.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

23

The movement produced when paddling a canoe.

a. Newton's 1st law
b. Newton's 2nd law
c. Newton's 3rd law
d. Bernoulli's principle

24

GAMESHEET ANSWERS

II.3 Laws and Principles of Motion

1. a) Newton's 1st law
2. d) Bernoulli's principle
3. d) Bernoulli's principle
4. c) Newton's 3rd law
5. b) Newton's 2nd law
6. b) Newton's 2nd law
7. d) Bernoulli's principle
8. c) Newton's 3rd law
9. a) Newton's 1st law
10. d) Bernoulli's principle
11. d) Bernoulli's principle
12. b) Newton's 1st law
13. b) Newton's 2nd law
14. c) Newton's 3rd law
15. c) Newton's 3rd law
16. a) Newton's 1st law
17. a) Newton's 1st law
18. d) Bernoulli's principle
19. c) Newton's 3rd law
20. d) Bernoulli's principle
21. c) Newton's 3rd law
22. d) Bernoulli's principle
23. d) Bernoulli's principle
24. c) Newton's 3rd law

TGT PHYSICAL SCIENCE

UNIT: Work, Force and Motion

WORKSHEET: Density

Objective: II.4--a. Students will define terms related to density.

b. Students will apply the density formula and find the density of regular and irregular shaped objects.

Instructions: This worksheet will help you prepare for Density Game. Read each item and choose the correct answer.

Vocabulary:

Archimedes' principle
buoyant force
density
force
mass
volume
weight

TGT WORKSHEET: II.4 Density

Mass is defined as:

a) The amount of space matter occupies.

b) The amount of matter in an object.

c) Force of gravity pulling on an object 1

Volume is defined as:

a) The amount of space matter occupies.

b) The amount of matter in an object.

c) Force of gravity pulling on an object. 2

Weight is defined as:

a) The amount of space matter occupies.

b) The amount of matter in an object.

c) Force of gravity pulling on an object. 3

The metric system unit for measuring mass is:

a) gram (g)

b) centimeter (cm)

c) cubic centimeter (cm^3)

d) meter (m)

4

In the metric system a unit for measuring volume is:

a) gram (g)

b) centimeter (cm)

c) cubic centimeter (cm^3)

d) meter (m) 5

Units used to express density in the metric system:

a) g/cm^3

b) g/cm

c m^1/g

6

To find the mass of a solid cube you would:

a) multiply L x W x H

b) place it on a balance

c) find its weight in water

7

To find the volume of a cube you would:

a) multiply L x W x H

b) place it on a balance

c) find its weight in water

8

To find the density of a cube you would

a) multiply L x W x H

b) multiply mass x volume

c) place it on a balance

d) divide mass by volume 9

In order to find the mass of an irregularly shaped object you would:

a) multiply L x W x H

b) place it on a balance

c) find its weight in water

10

In order to find the volume of an irregularly shaped object you would:

a) multiply W x H x L

b) place it on a balance

c) use displacement of water

11

To find the density of an irregularly shaped object you would:

a) multiply L x W x H

b) multiply mass x volume

c) divide mass by volume

d) place it on a balance 12

Who discovered the displacement method of finding volume?

a) Bernoulli

b) Archimedes

c) Newton

13

According to Archimedes' principle, an object displaces its _____ in water.

a) mass

b) weight

c) volume

14

A graduate was filled to the 50 cm^3 line with water. When an object was placed in it the reading was 80 cm^3. Its volume was:

a) 30 cm^3

b) 80 cm^3

c) 130 cm^3

15

TGT WORKSHEET: II.4 Density

In the problem information presented below, does the submerged object appear to:

a) gain weight

b) lose weight

c) stay the same

16

In the problem information presented below, what is the volume of the object?

a) 30 cm^3

b) 90 cm^3

c) 60 cm^3

17

How does the volume compare with the apparent loss of mass when submerged?

a) it was greater

b) it was the same

c) it was less

18

The object weighs _______ in water as compared to alcohol.

a) less

b) more

c) the same

19

The density of the object is:

a) 2.5 g/cm^3

b) 7 g/cm^3

c) 4.67 g/cm^3

20

A cube is 2cm-5cm-10cm. Its mass is 50 grams. What is its density?

a) 2 g/cm^3

b) .5 g/cm^3

c) 5 g/cm^3

21

What is the density of an object that has a mass of 60 grams and a volume of 20 cm^3?

a) 2 g/cm^3

b) 5 g/cm^3

c) 3 g/cm^3

22

An object has a volume of 100 cm^3 and a mass of 80 grams. What is its density?

a) .8 g/cm^3

b) 1.2 g/cm^3

c) 1.8 g/cm^3

23

If an object has a density of 1.5 and is placed in water, it will:

a) float

b) sink

c) stay where you put it

24

Problem Information:

An object is weighed on a platform balance, and its mass is 280 g.

The object is then weighed when submerged in a beaker of water, and its apparent mass is 220 g.

It is then weighed when submerged in a beaker of alcohol, and its apparent mass is 232 g.

The object is then placed in a graduated cylinder. The level of the water in the cylinder before the object is placed into it is 30 cm^3. With the object submerged in the water, the level is 90 cm^3.

WORKSHEET ANSWERS

II.4 Density

1. (b) The amount of matter in an object.
2. (a) The amount of space matter occupies.
3. (c) Force of gravity pulling on an object.
4. (a) gram (g)
5. (c) cubic centimeter (cm^3)
6. (a) g/cm^3
7. (b) place it on a balance
8. (a) multiply L x W x H
9. (d) divide mass by volume
10. (b) place it on a balance
11. (c) use displacement of water
12. (c) divide mass by volume
13. (b) Archimedes
14. (c) volume
15. (a) 30 cm^3
16. (b) lose weight
17. (c) 60 cm^3
18. (b) it was the same
19. (a) less
20. (c) 4.67 g/cm^3
21. (b) .5 g/cm^3
22. (c) 3 g/cm^3
23. (a) .8 g/cm^3
24. (b) sink

TGT GAMESHEET: [illegible] 4 Density

In order to find the volume of an irregularly shaped object you would: a) multiply W x H x L b) place it on a balance c) use displacement of water 1	Weight is defined as: a) The amount of space matter occupies. b) The amount of matter in an object. c) Force of gravity pulling on an object 2	In order to find the mass of an irregularly shaped object you would: a) multiply L x W x H b) place it on a balance c) find its weight in water 3
To find the volume of a cube you would: a) multiply L x W x H b) place it on a balance c) find its weight in water 4	To find the density of a cube you would: a) multiply L x W x H b) multiply mass x volume c) divide mass by volume 5	The metric system unit for measuring mass is: a) gram (g) b) centimeter (cm) c) cubic centimeter (cm^3) 6
In the metric system a unit for measuring volume is: a) gram (g) b) centimeter (cm) c) cubic centimeter (cm^3) 7	Units used to express density in the metric system: a) g/cm^3 b) g/cm c) m^1/g 8	To find the mass of a solid cube you would: a) multiply L x W x H b) place it on a balance c) find its weight in water 9
Volume is defined as: a) The amount of space matter occupies. b) The amount of matter in an object. c) mass x density 10	Mass is defined as: a) The amount of space matter occupies. b) The amount of matter in an object. c) Force of gravity pulling on an object. 11	To find the density of an irregularly shaped object you would: a) multiply L x W x H b) multiply mass x volume c) divide mass by volume 12
Who discovered the displacement method of finding volume? a) Bernoulli b) Archimedes c) Newton 13	According to Archimedes' principle, an object displaces its _______ in water a) mass b) weight c) volume 14	A graduate was filled to the 60 cm^3 line with water. When an object was placed in it the reading was 100 cm^3. Its volume was: a) 40 cm^3 b) 60 cm^3 c) 160 cm^3 15

TGT GAMESHEET: II.4 Density

In the problem information, does the submerged object appear to:

a) gain weight

b) lose weight

c) stay the same

16

In the problem information, what is the volume of the object?

a) 40 cm^3

b) 110 cm^3

c) 70 cm^3

17

In the problem information, how does the volume compare with the apparent loss of mass when submerged?

a) it was greater

b) it was the same

c) it was less

18

In the problem information, the object weighs _____ in water as compared to alcohol.

a) less

b) more

c) the same

19

In the problem information, the density of the cylinder is:

a) 2.5 g/cm^3

b) 7 g/cm^3

c) 4.6 g/cm^3

20

A cube is 2cm-4cm-12cm. Its mass is 50 grams. What is its density?

a) 2 g/cm^3

b) .5 g/cm^3

c) 5 g/cm^3

21

What is the density of an object that has a mass of 90 grams and a volume of 30 cm^3?

a) 2 g/cm^3

b) 5 g/cm^3

c) 3 g/cm^3

22

An object has a volume of 50 cm^3 and a mass of 40 grams. What is its density?

a) .8 g/cm^3

b) 1.2 g/cm^3

c) 1.8 g/cm^3

23

If an object has a density of 1.5 and is placed in water, it will:

a) float

b) sink

c) stay where you put it

24

Problem Information:

An object is weighed on a platform balance, and its mass is 322 g.

The object is then weighed when submerged in a beaker of water, and its apparent mass is 252 g.

It is then weighed when submerged in a beaker of alcohol, and its apparent mass is 266 g.

The object is then placed in a graduated cylinder. The level of the water in the cylinder before the object is placed into it is 30 cm^3. With the object submerged in the water, the level is 100 cm^3.

GAMESHEET ANSWERS

II.4 Density

1. (c) use displacement of water
2. (c) Force of gravity pulling on an object.
3. (b) place it on a balance
4. (a) multiply L x W x H
5. (c) divide mass by volume
6. (a) gram (g)
7. (c) cubic centimeter (cm^3)
8. (a) g/cm^3
9. (b) place it on a balance
10. (a) The amount of space matter occupies.
11. (b) The amount of matter in an object.
12. (c) divide mass by volume
13. (b) Archimedes
14. (c) volume
15. (a) 40 cm^3
16. (b) lose weight
17. (c) 70 cm^3
18. (b) it was the same
19. (a) less
20. (c) 4.6 g/cm^3
21. (b) .5 g/cm^3
22. (c) 3 g/cm^3
23. (a) .8 g/cm^3
24. (b) sink

TGT PHYSICAL SCIENCE

UNIT: Work, Force and Motion

WORKSHEET: Energy Conversions

Objective: II.5--Students will identify energy conversions that take place in common energy conversion systems.

Instructions: This worksheet will help you prepare for the Energy Conversion Game. Read each item carefully. Choose one or more forms of energy from the Forms of Energy chart at the bottom of the page to fill in the blanks.

Vocabulary:

energy
flourescent
incandescent
work

Forms of Energy

chemical energy
electrical energy
heat energy
mechanical energy
nuclear energy
sound energy
light energy

TGT WORKSHEET: II.5 Energy Conversions

A generator changes ______ energy to electrical energy. 1	A piano changes mechanical energy to ________ energy. 2	A match changes chemical energy to ________ energy and ________ energy. 3
A toaster changes electrical energy to ________ energy and __________ energy. 4	A solar cell changes ________ energy to electrical energy. 5	A gas stove changes _________ energy to heat energy. 6
A T.V. changes electrical energy to _________ energy and _________ energy. 7	A motor changes electrical energy to _________ energy. 8	An atomic reactor changes ___________ energy to heat energy. 9
A dry cell changes _________ energy to electrical energy. 10	Dynamite changes chemical energy to ________ energy, ________ energy, heat energy and light energy. 11	An elevator changes electrical energy to _________ energy. 12
A steam engine changes heat energy to _______________ energy. 13	A telephone receiver changes electrical energy to _______ energy. 14	A drum changes ___________ energy to sound energy. 15
A radiometer changes light energy to _______ energy. 16	A fuel cell changes ________ energy to electrical energy. 17	A candle changes chemical energy to __________ energy and ________ energy. 18
An electromagnet changes electrical energy to ________ energy. 19	A camera changes light energy to _________ energy. 20	A microphone changes sound energy to __________ energy. 21
An incandescent light bulb changes __________ energy to ___________ energy and light energy. 22	A firefly changes _________ energy to light energy. 23	A thermocouple changes heat energy to _________ energy. 24
A flourescent tube changes electrical energy to _____ energy. 25	An infrared cooker changes light energy to _________ energy. 26	An internal combustion engine changes chemical energy and heat energy to ___________ energy 27
An oil lantern changes ___________ energy to light energy. 28	A microwave oven changes electrical energy to _______ energy. 29	

WORKSHEET ANSWERS

II.5 Energy Conversions

1. mechanical
2. sound
3. light and heat
4. heat and light
5. light
6. chemical
7. light and sound
8. mechanical
9. nuclear
10. chemical
11. sound and mechanical
12. mechanical
13. mechanical
14. sound
15. mechanical
16. mechanical
17. chemical
18. light and heat
19. mechanical
20. chemical
21. electrical
22. electrical, heat
23. chemical
24. electrical
25. light
26. heat
27. mechanical
28. chemical
29. heat

TGT GAMESHEET: II.5 Energy Conversions

A generator changes _______ energy to electrical energy. 1

A match changes chemical energy to _________ energy and _________ energy. 2

A fuel cell changes _________ energy to electrical energy. 3

A toaster changes electrical energy to __________ energy and __________ energy. 4

A gas stove changes _________ energy to heat energy. 5

A camera changes light energy to ___________ energy. 6

A T.V. changes electrical energy to _________ energy and __________ energy. 7

An atomic reactor changes ____________ energy to heat energy. 8

A firefly changes ___________ energy to light energy. 9

A dry cell changes _________ energy to electrical energy. 10

An elevator changes electrical energy to ___________ energy. 11

An infrared cooker changes light energy to __________ energy. 12

A steam engine changes heat energy to _________ energy. 13

A drum changes _________ energy to sound energy. 14

A candle changes chemical energy to _________ energy and __________ energy. 15

A piano changes mechanical energy to __________ energy. 16

A radiometer changes light energy to __________ energy. 17

A microphone changes sound energy to __________ energy. 18

A solar cell changes _______ energy to electrical energy. 19

An electromagnet changes electrical energy to ________ energy. 20

A thermocouple changes heat energy to __________ energy. 21

A motor changes electrical energy to _________ energy. 22

An incandescent light bulb changes _________ energy to __________ energy and light energy. 23

An internal combustion engine changes chemical energy and heat energy to _____________ energy. 24

Dynamite changes chemical energy to __________ energy, ___________ energy, heat energy and light energy. 25

A flourescent tube changes electrical energy to _________ energy. 26

A microwave oven changes electrical energy to ________ energy. 27

A telephone receiver changes electrical energy to _______ energy. 28

An oil lantern changes _______ energy to light energy and heat energy. 29

GAMESHEET ANSWERS

II.5 Energy Conversions

1. mechanical
2. heat and light
3. chemical
4. heat and light
5. chemical
6. chemical
7. light and sound
8. nuclear
9. chemical
10. chemical
11. mechanical
12. heat
13. mechanical
14. mechanical
15. light and heat
16. sound
17. mechanical
18. electrical
19. light
20. mechanical
21. electrical
22. mechanical
23. electrical, heat
24. mechanical
25. sound, mechanical
26. light
27. heat
28. sound
29. chemical

TGT PHYSICAL SCIENCE

UNIT: Work, Force and Motion

WORKSHEET: Work, Force and Motion Vocabulary Review

Objective: II.6--Students will define the basic vocabulary words used in the Work, Force and Motion unit.

Instructions: This worksheet will help you prepare for the Work, Force and Motion Vocabulary Review Game. In numbers 1-15, use the clue words to help you unscramble the letters and spell the word correctly. In numbers 16-30, provide the word that matches the definition. The game will be like items 16-30 and you will have to provide the word without a vocabulary list.

Vocabulary:

acceleration
Actual M.A.
buoyancy
center of gravity
density
efficiency
effort (force)
equilibrium
force
friction
fulcrum
gravity (force)
hydrometer
Ideal M.A.
inertia (force)
kinetic energy
machine
mass
moment
newton
potential energy
power
resistance (force)
resultant
vector
velocity
volume
weight
wheel axle
work

TGT WORKSHEET: II.6 Work, Force and Motion Vocabulary Review

optetilna (energy) 1	hewel (machine) 2	cfmulru (lever) 3
tygvari (force) 4	emlovu (amount of space) 5	roefc (push or pull) 6
sams (amount of matter) 7	nitekci (energy) 8	queliribimu (cancelled forces) 9
tairnei (force) 10	notewn (force unit) 11	tcrfioni (force) 12
olevtyic (vector) 13	anbucyoy (force) 14	tredyhmero (density instrument) 15
Changing the speed of a moving object. 16	A quantity which has strength and direction. 17	The result of the force of gravity on a mass. 18
A device used for multiplying an effort. 19	A comparison between the work input and the work output. 20	The number of times a machine should multiply the effort. 21
Force used to do work. 22	The rate of doing work. 23	A force that opposes the effort. 24
The moving of an object through a distance. 25	A force produced by two or more forces acting on an object. 26	The number of times a machine multiplies the effort. 27
Force on a lever multiplied by the distance from the pivot point. 28	Mass per unit volume. 29	A point at which all of the weight of a body may be considered to be concentrated. 30

WORKSHEET ANSWERS

II.6 Work, Force and Motion Vocabulary Review

1. potential
2. wheel
3. fulcrum
4. gravity
5. volume
6. force
7. mass
8. kinetic
9. equilibrium
10. inertia
11. newton
12. friction
13. velocity
14. buoyancy
15. hydrometer
16. acceleration
17. vector
18. weight
19. machine
20. efficiency
21. ideal mechanical advantage
22. effort
23. tower
24. resistance
25. work
26. resultant
27. actual mechanical advantage
28. moment
29. density
30. center of gravity

TGT GAMESHEET: II.6 Work, Force and Motion Vocabulary Review

Energy of rest or position. 1	A simple machine which is a variation of the lever. 2	The point on which a lever rotates. 3
The mutual force of attraction which exists between all bodies in the universe. 4	The amount of space matter occupies. 5	Any push or pull. 6
The quantity of matter in a body. 7	Energy of motion. 8	The state of balance between equal opposing forces. 9
The tendency of matter to remain at rest or in uniform motion unless acted upon by a force. 10	Metric unit of force; force required to accelerate a 1-kg mass at 1 m/sec^2. 11	A force that opposes motion. 12
The speed and direction of a moving body. 13	The force that pushes up on objects when they are placed in a fluid. 14	The instrument used to determine the specific gravity of liquids. 15
Changing the speed of a moving object. 16	A quantity which has strength and direction. 17	The result of the force of gravity on a mass. 18
A device used for multiplying an effort. 19	A comparison between the work input and the work output. 20	The number of times a machine should multiply the effort. 21
Force used to do work. 22	The rate of doing work. 23	A force that opposes the effort. 24
The moving of an object through a distance. 25	A force produced by two or more forces acting on an object. 26	The number of times a machine multiplies the effort. 27
Force on a lever multiplied by the distance from the pivot point. 28	Mass per unit volume. 29	A point at which all of the weight of a body may be considered to be concentrated. 30

GAMESHEET ANSWERS

II.6 Work, Force and Motion Vocabulary Review

1. potential energy
2. wheel and axle
3. fulcrum
4. gravity
5. volume
6. force
7. mass
8. kinetic
9. equilibrium
10. inertia
11. newton
12. friction
13. velocity
14. buoyancy
15. hydrometer
16. acceleration
17. vector
18. weight
19. machine
20. efficiency
21. Ideal M.A.
22. effort
23. power
24. resistance
25. work
26. resultant
27. Actual M.A.
28. moment
29. density
30. center of gravity

TGT PHYSICAL SCIENCE

UNIT: Work, Force and Motion

WORKSHEET: Parts of a Car

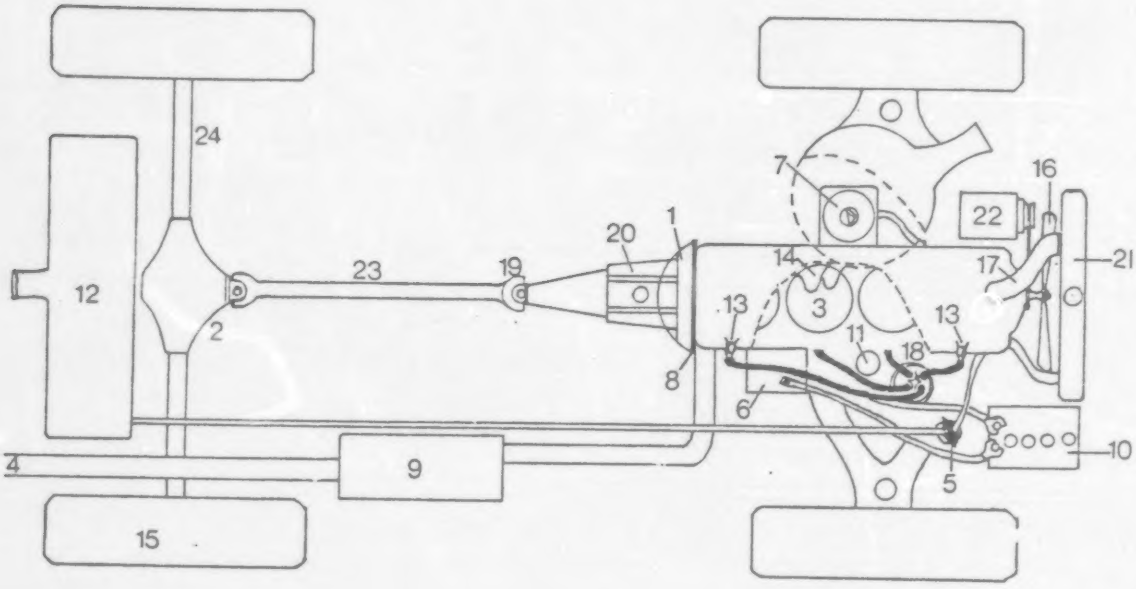
Objective: II.7--Students will identify the main parts of the car.

Instructions: This worksheet will help you prepare for the Parts of a Car Game. Study the diagram to help you learn the parts. On the worksheet, write the names of the numbered parts.

Vocabulary:

axle
battery
carburetor
clutch housing
coil
cylinder
differential gear
distributor
drive shaft
driving wheels
exhaust pipe
fan
flywheel
gasoline pump
gasoline tank
generator
mufflers
radiator hose
radiator
spark plugs
starter
transmission gears
universal joint
valves

II.7--Parts of a Car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axle
battery
carburetor
clutch housing
coil
cylinder
differential gear
distributor

drive shaft
driving wheels
exhaust pipe
fan
flywheel
gasoline pump
gasoline tank
generator

muffler
radiator hose
radiator
spark plugs
starter
transmission
universal joint
valves

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22.

23.

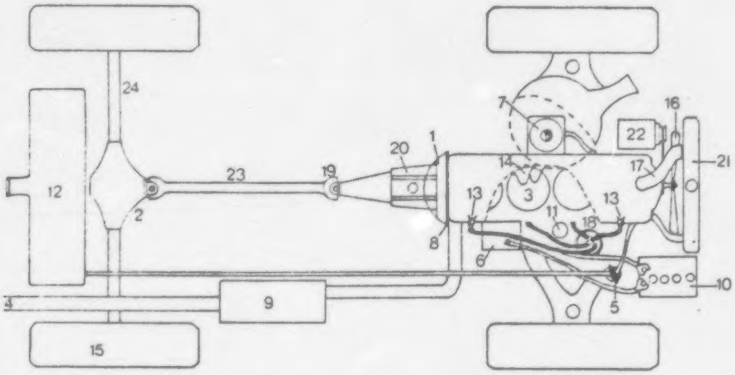
24.

WORKSHEET ANSWERS

II.7 Parts of a Car

1. clutch housing
2. differential gear
3. cylinder
4. exhaust pipe
5. gasoline pump (fuel pump)
6. starter
7. carburetor
8. flywheel
9. muffler
10. battery
11. coil
12. gasoline tank
13. spark plug
14. valves
15. driving wheels
16. fan
17. radiator hose
18. distributor
19. universal joint
20. transmission
21. radiator
22. generator
23. drive shaft
24. axle

TGT GAMESHEET: II.7--Parts of a Car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11
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6
10
4
9
5
15

Part 12 is . . . 1	Part 5 is . . . 2	Part 7 is . . . 3
Part 14 is . . . 4	Part 18 is . . . 5	Part 3 is . . . 6
Part 11 is . . . 7	Part 17 is . . . 8	Part 22 is . . . 9
Part 16 is . . . 10	Part 13 is . . . 11	Part 21 is . . . 12
Part 8 is . . . 13	Part 1 is . . . 14	Part 20 is . . . 15
Part 23 is . . . 16	Part 2 is . . . 17	Part 24 is . . . 18
Part 15 is . . . 19	Part 4 is . . . 20	Part 9 is . . . 21
Part 10 is . . . 22	Part 6 is . . . 23	Part 19 is . . . 24

GAMESHEET ANSWERS

II.7 Parts of a Car

1. gasoline tank
2. gasoline pump
3. carburetor
4. valves
5. distributor
6. cylinder
7. coil
8. radiator hose
9. generator
10. fan
11. spark plug
12. radiator
13. flywheel
14. clutch housing
15. transmission
16. drive shaft
17. differential gear
18. axle
19. driving wheels
20. exhaust pipe
21. muffler
22. battery
23. starter
24. universal joint

TGT PHYSICAL SCIENCE

UNIT: Light and Sound

WORKSHEET: Light and Matter Relationships

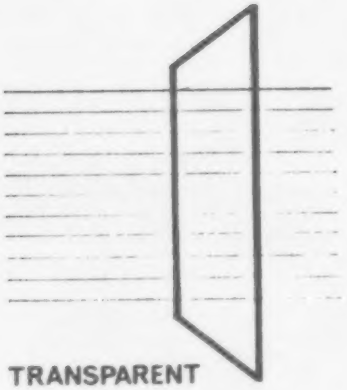
Objective: III.1--Students will classify objects according to their relationship with light.

Instructions: This worksheet will help you prepare for the Light and Matter Relationships Game. Using the data sheet as an aid, classify each object as being transparent, translucent, or opaque.

Vocabulary:

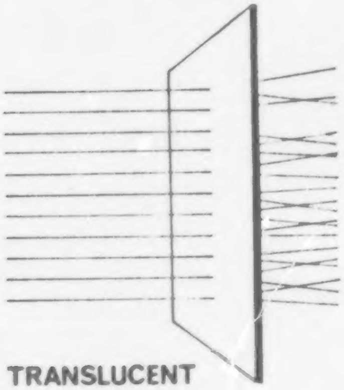
opaque
translucent
transparent

Data Sheet



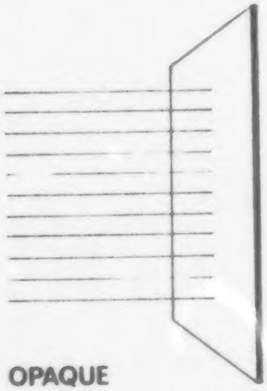
TRANSPARENT

Light passing through an object unchanged.



TRANSLUCENT

Light passing through an object and being scattered. An object on the light side cannot be seen.



OPAQUE

Light being absorbed by an object. An opaque object may reflect and/or absorb light. No light passes through.

TGT WORKSHEET: III.1 Light and Matter Relationships

Transmits some light but objects cannot be seen clearly through it. ________ 1	Light hits an object and is absorbed or reflected. ________ 2	Light passes through an object and another object is clearly visible. ________ 3
book ________ 4	waxpaper ________ 5	tin cup ________ 6
window ________ 7	lamp shade ________ 8	air ________ 9
onion skin paper ________ 10	baseball ________ 11	mirror ________ 12
tap water ________ 13	steamed window ________ 14	prism ________ 15
frosted light bulb ________ 16	shoes ________ 17	desk top ________ 18
amber bottle ________ 19	glass shower enclosure ________ 20	brick wall ________ 21
cardboard box ________ 22	plain drinking glass ________ 23	glass bricks ________ 24

WORKSHEET ANSWERS

III.1 Light and Matter Relationships

1. translucent
2. opaque
3. transparent
4. opaque
5. translucent
6. opaque
7. transparent
8. translucent
9. transparent
10. translucent
11. opaque
12. opaque
13. transparent
14. translucent
15. transparent
16. translucent
17. opaque
18. opaque
19. transparent
20. translucent
21. opaque
22. opaque
23. transparent
24. translucent

TGT GAMESHEET: III.1 Light and Matter Relationships

mirror ____________ 1	steamed window ____________ 2	prism ____________ 3
lamp shade ____________ 4	amber bottle ____________ 5	window ____________ 6
desk top ____________ 7	shoes ____________ 8	air ____________ 9
tin cup ____________ 10	book ____________ 11	waxpaper ____________ 12
brick wall ____________ 13	Light hits an object and is absorbed or reflected. ____________ 14	tap water ____________ 15
football ____________ 16	Transmits some light but objects cannot be seen clearly through it. ____________ 17	Light passes through an object and another is clearly visible. ____________ 18
onion skin paper ____________ 19	glass bricks ____________ 20	frosted light bulb ____________ 21
plain drinking glass ____________ 22	glass shower enclosure ____________ 23	cardboard box ____________ 24

GAMESHEET ANSWERS

III.1 Light and Matter Relationships

1. opaque
2. translucent
3. transparent
4. translucent
5. transparent
6. transparent
7. opaque
8. opaque
9. transparent
10. opaque
11. opaque
12. translucent
13. opaque
14. opaque
15. transparent
16. opaque
17. translucent
18. transparent
19. translucent
20. translucent
21. translucent
22. transparent
23. translucent
24. opaque

TGT PHYSICAL SCIENCE

UNIT: Light and Sound

WORKSHEET: Refraction and Reflection

Objective:

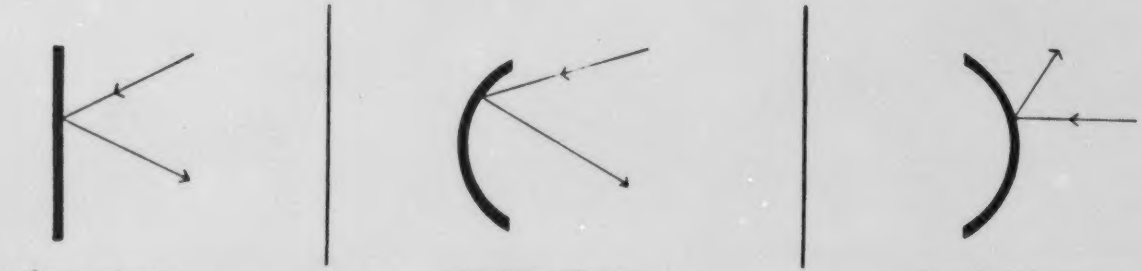
III.2--a. Students will be able to identify types of mirrors.
b. Students will determine the path light will take as it passes through a transparent media.
c. Students will determine the path light will take as it is reflected by a mirror.

Instructions: This worksheet will help you prepare for the Refraction and Reflection Game. Study the information and diagrams carefully. Using this information as a reference, choose the correct path which light would take as it is reflected or refracted. The reference sheet will not be used in the tournament.

Vocabulary:

concave
convex
incident ray
prism
reflection
refraction
transparent

Figure 1: Types of Mirrors



plane mirror — concave mirror — convex mirror

TGT WORKSHEET: III.2 Refraction and Reflection

Figure 2: A light ray is refracted in the same direction as it enters and leaves a glass prism.

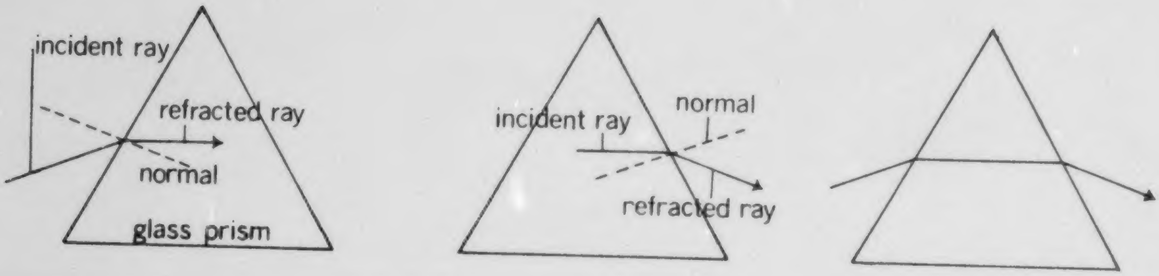

incident ray
refracted ray
normal
glass prism
incident ray
normal
refracted ray

Figure 3: The behavior of light rays when they pass through lenses of different curvatures.

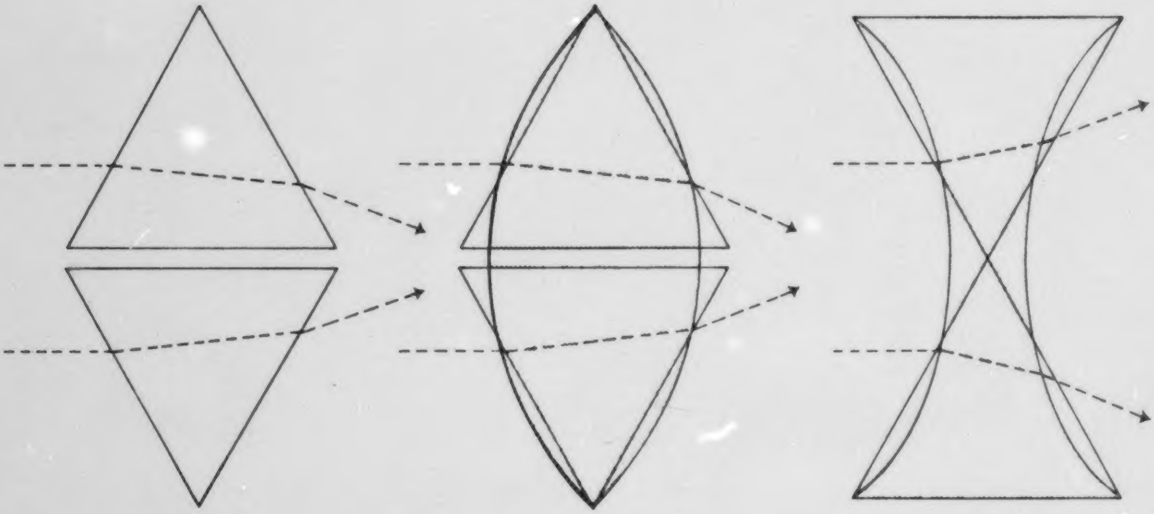
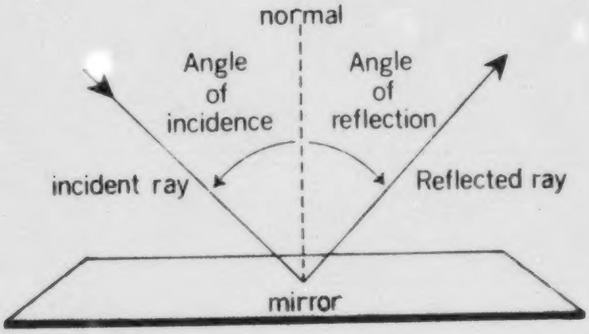


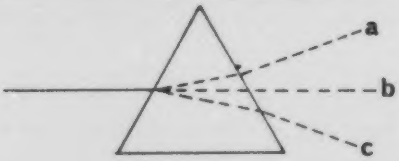
Figure 4: Light Reflection from a Plane Mirror

A flat, polished surface that reflects light without diffusing it is called a plane mirror. The angle at which light is reflected from a mirror is the same as the angle at which it strikes the mirror. In other words, the angle of reflection equals the angle of incidence. A ball bouncing on the sidewalk obeys the same law of reflection.


normal
Angle of incidence
Angle of reflection
incident ray
Reflected ray
mirror

TGT WORKSHEET: III.2 Refraction and Reflection

1



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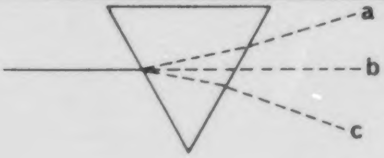

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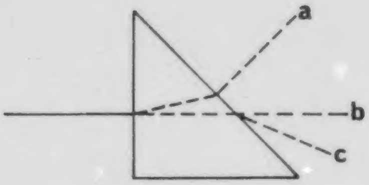

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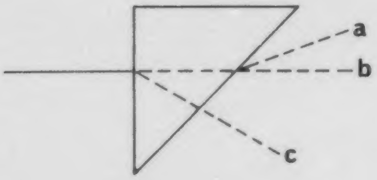

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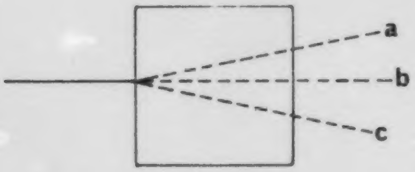

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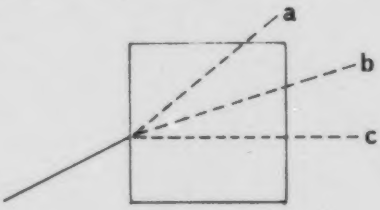

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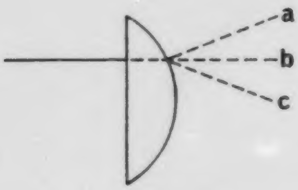

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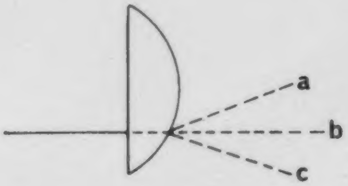

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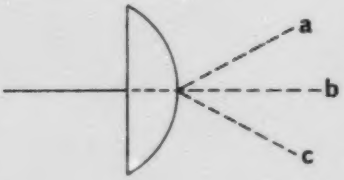

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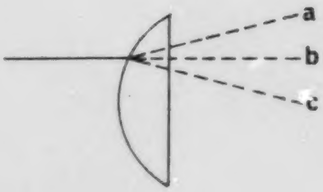

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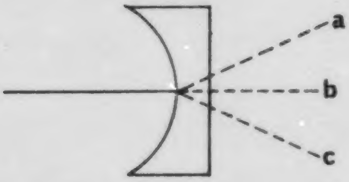

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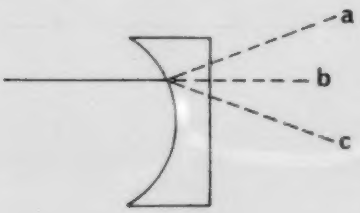
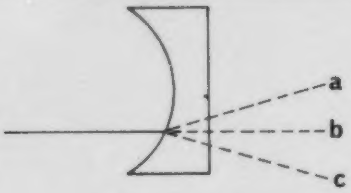


TGT WORKSHEET: III.2 Refraction and Reflection

13



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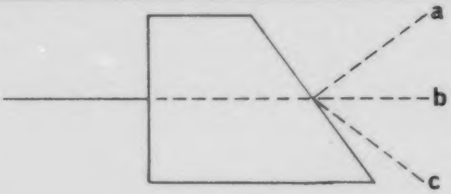

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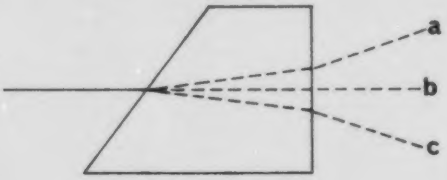

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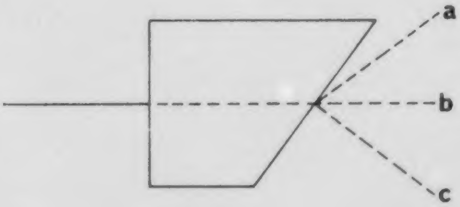

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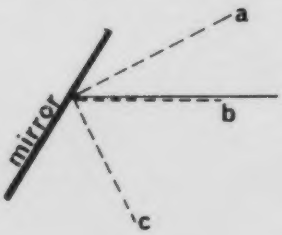

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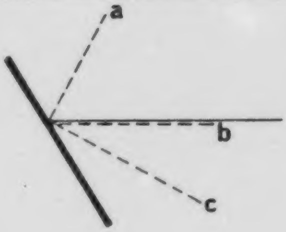

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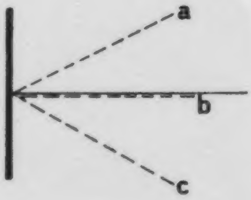

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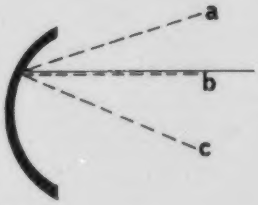

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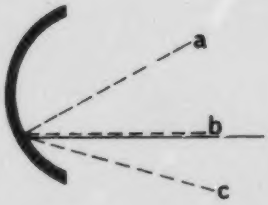

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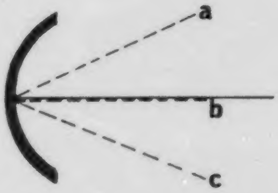

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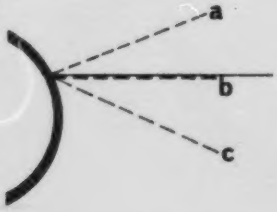

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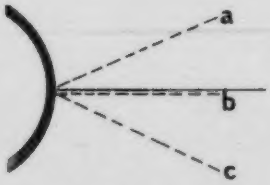

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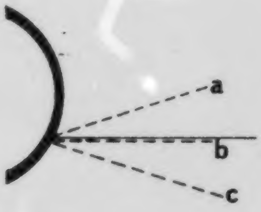


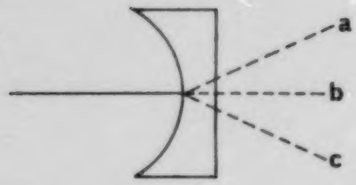
WORKSHEET ANSWERS

III.2 Refraction and Reflection

1. c
2. a
3. c
4. a
5. b
6. b
7. c
8. a
9. b
10. c
11. b
12. a
13. c
14. c
15. c
16. a
17. c
18. a
19. b
20. c
21. a
22. b
23. a
24. b
25. c

TGT GAMESHEET: III.2 Refraction and Reflection

1



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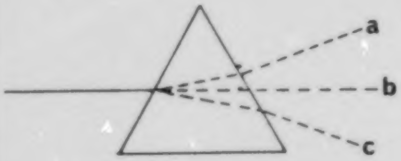

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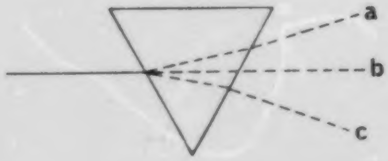

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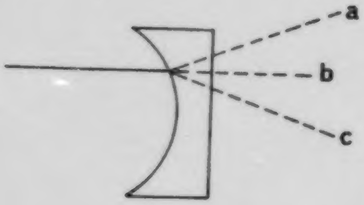

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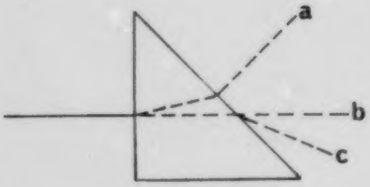

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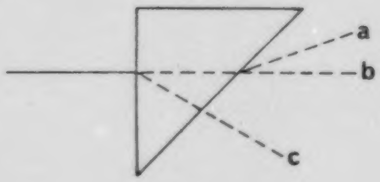

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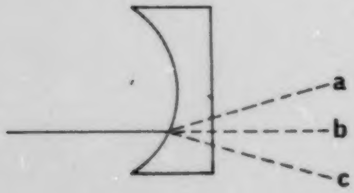

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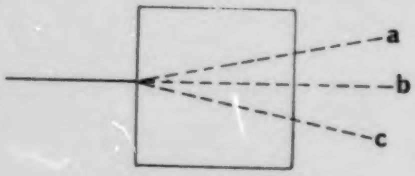

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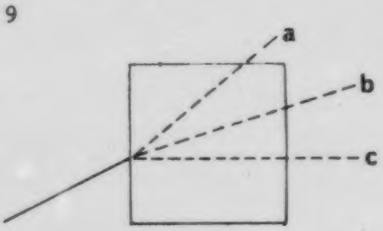

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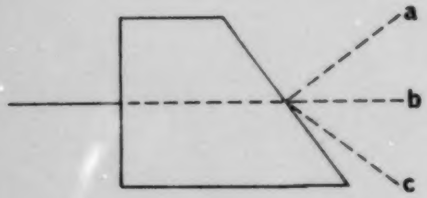

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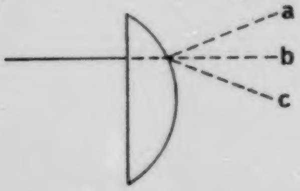

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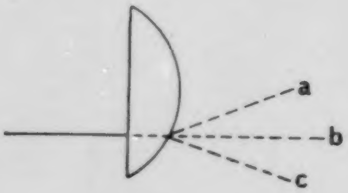

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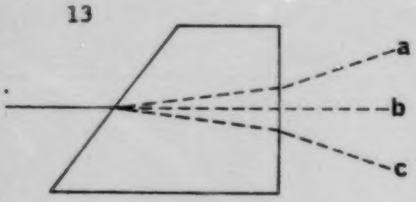

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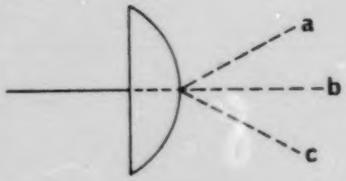

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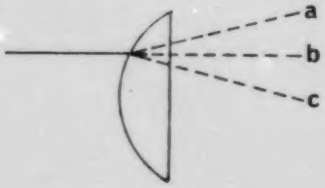
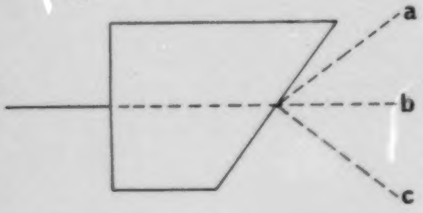


TGT GAMESHEET: III.2 Refraction and Reflection

16



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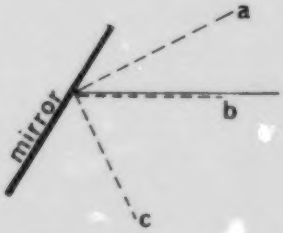

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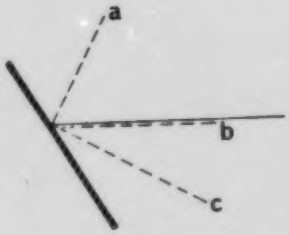

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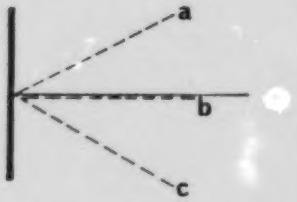

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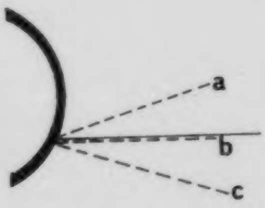

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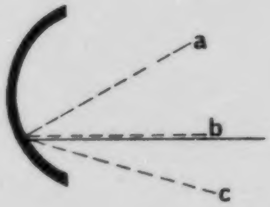

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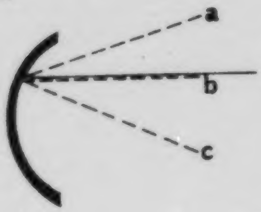

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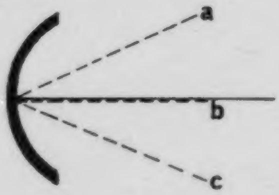

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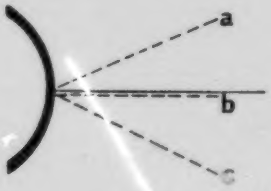


GAMESHEET ANSWERS

III.2 Refraction and Reflection

1. b
2. c
3. a
4. a
5. c
6. a
7. c
8. b
9. b
10. c
11. c
12. a
13. c
14. b
15. c
16. a
17. c
18. a
19. b
20. c
21. a
22. c
23. b
24. b

TGT PHYSICAL SCIENCE

UNIT: Light and Sound

WORKSHEET: The Eye

Objective: III.3 --a. Students will identify the parts of the eye.

b. Students will identify the functions of the parts of the eye.

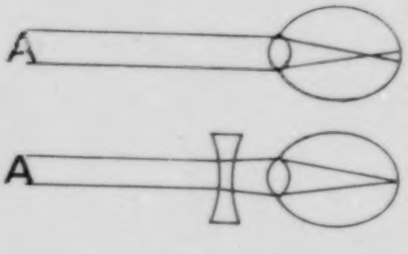
c. Students will recognize the differences between nearsightedness and farsightedness.

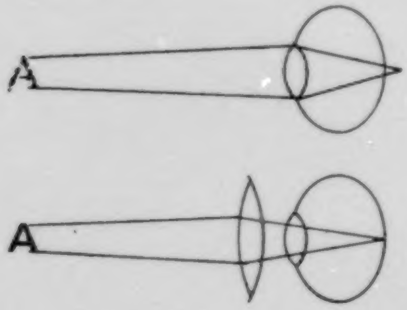
Instructions: The worksheet will help you prepare for The Eye Game. In numbers 1-7, write the name of the numbered part on the diagram of the eye. In 8-16, a function of a part is given; write in the name of the part. In 19-26, fill in the blanks.

Vocabulary:

concave lens
cones
convex lens
focus
inverted
real image
rods

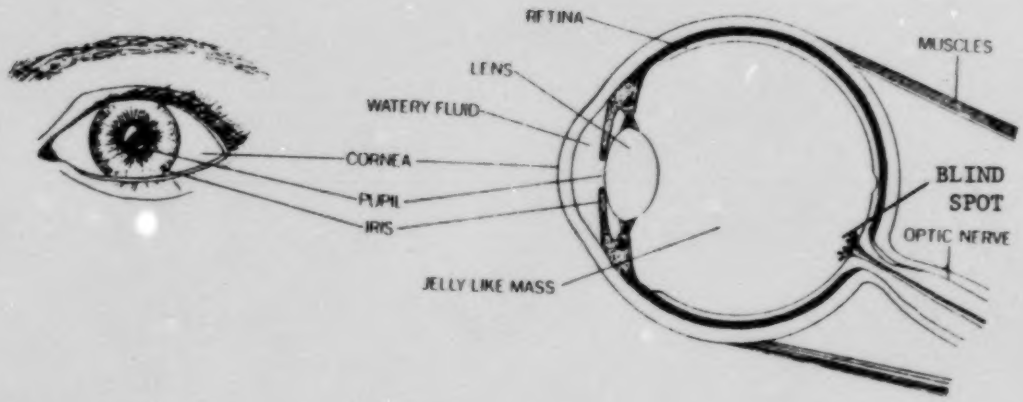
The eyeballs of nearsighted people are too long; as a result, light rays from distant objects come to a focus before they reach the retina. Glasses with concave lenses correct the defect by spreading the rays apart before the lens of the eye focuses them.





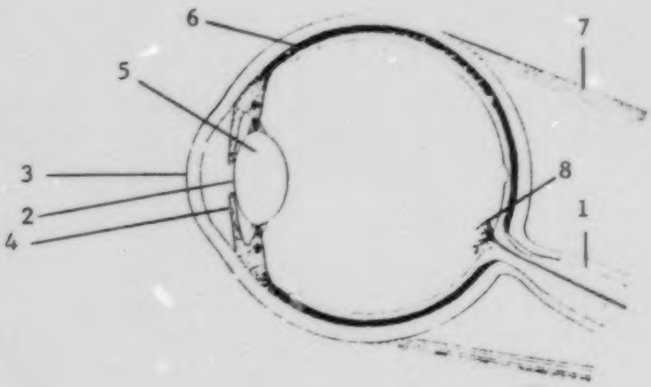
The eyeballs of farsighted people are too short; as a result, the lens of the eye must bend light rays from near objects more sharply than normal to bring them to a focus on the retina. By bending the light rays before they reach the lens of the eye, convex lenses help to focus the rays on the retina.

Light enters the eye through the pupil. The lens focuses the light on the retina. The light stimulates the nerve cells in the retina. "Messages", or impulses, are sent from nerve cells along the optic nerve to the brain, where the messages are interpreted - that is, you "see".


RETINA
MUSCLES
LENS
WATERY FLUID
CORNEA
BLIND SPOT
PUPIL
IRIS
OPTIC NERVE
JELLY LIKE MASS

TGT WORKSHEET: III.3 The Eye

In the spaces provided at the right, label in the main parts of the eye.



1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________
6. ______________________________
7. ______________________________
8. ______________________________

The transparent part of the eyeball. It protects the lens. 9	Opening that allows light in the eye to pass through. 10	The layer of light sensitive nerve endings lining the back of the eye. 11
Focuses incoming light onto the retina. 12	Nerve endings in the retina which are sensitive to color. 13	Carries impulses from the eye to the brain. 14
Controls the amount of light coming into the eye. 15	Nerve endings in the retina that are sensitive to light but not color. 16	Controls the movement of the eye. 17
If you cannot see distant objects clearly you may have a condition known as ________________________. 18	If you can see distant objects clearly, but cannot see objects that are close clearly, the condition is called _______.19	Due to the type of lens in the eye the image is in a/an __________ position on the retina. 20.
Nearsightedness is a result of the image being formed _____________ of the retina. 21	Farsightedness is a result of the image being formed _______________ of the retina. 22	A _____________ lens can be used to correct nearsightedness. 23
A ________________ lens can be used to correct farsightedness. 24	If the cones in the eye are not functioning properly, the condition is known as ___________________. 25	An area on the retina where there are no rods or cones is a(n) _________________. 26

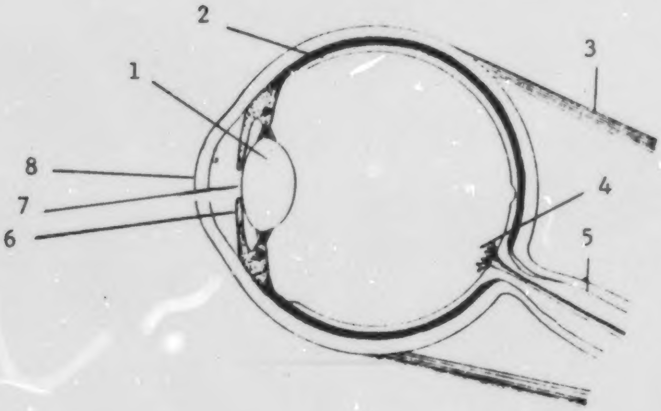
WORKSHEET ANSWERS

III.3 The Eye

1. optic nerve
2. pupil
3. cornea
4. iris
5. lens
6. retina
7. muscle
8. blind spot
9. cornea
10. pupil
11. retina
12. lens
13. cones
14. optic nerve
15. iris
16. rods
17. muscle
18. nearsightedness
19. farsightedness
20. inverted
21. in front of
22. behind
23. concave
24. convex
25. color blind
26. blind spot

TGT GAMESHEET: III.3 The Eye

Name the main parts of the eye.



1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________
7. ____________________
8. ____________________

Opening that allows light in the eye to pass through. 9	A ____________ lens can be used to correct farsightedness. 10	If the cones in the eye are not functioning properly, the condition is known as ____________________. 11
Nerve endings in the retina which are sensitive to color. 12	The layer of light sensitive nerve endings lining the back of the eye. 13	The transparent part of the eyeball. It protects the lens. 14
Nerve endings in the retina that are sensitive to light but not color. 15	Carries impulses from the eye to the brain. 16	Focuses incoming light onto the retina. 17
An area on the retina where there are no rods or cones is a(n) ____________. 18	Controls the movement of the eye. 19	Controls the amount of light coming into the eye. 20
Due to the type of lens in the eye the image is in a/an __________ position on the retina. 21	If you cannot see distant objects clearly you may have a condition known as ____________________. 22	If you can see distant objects clearly, but cannot see objects that are close clearly, the condition is called ________. 23
Nearsightedness is a result of the image being formed __________ of the retina. 24	Farsightedness is a result of the image being formed __________ of the retina. 25	A ___________ lens can be used to correct nearsightedness. 26

GAMESHEET ANSWERS

III.3 The Eye

1. lens
2. retina
3. muscle
4. blindspot
5. optic nerve
6. iris
7. pupil
8. cornea
9. pupil
10. convex
11. color blindness
12. cones
13. retina
14. cornea
15. rods
16. optic nerve
17. lens
18. blind spot
19. muscle
20. iris
21. inverted
22. nearsightedness
23. farsightedness
24. in front of
25. behind
26. concave

TGT PHYSICAL SCIENCE
UNIT: Light and Sound
WORKSHEET: Producing Color

Objective: III.4--a. Students will identify the color systems and their primaries.

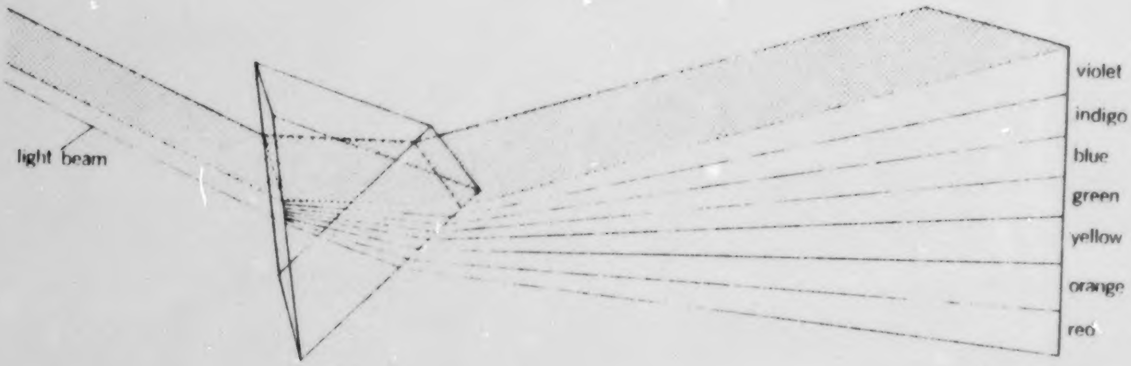
b. Students will order and identify the colors of the spectrum.

c. Students will predict the results of mixing colors and color systems.

Instructions: This worksheet will help you prepare for the Producing Color Game. Use the information sheet on the next page to help answer each item on the worksheet.

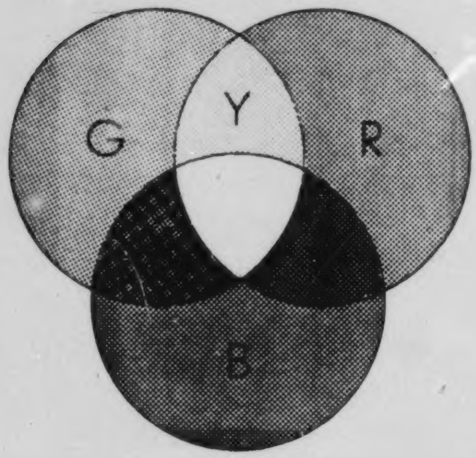
Vocabulary:

additive system
opaque
primary colors
primary pigments
subtractive system
transparent


light beam
violet
indigo
blue
green
yellow
orange
red

White light can be refracted to produce a spectrum. The colors from red to violet are dispersed on the screen in the order of longest red wavelength to the shortest violet wavelength.

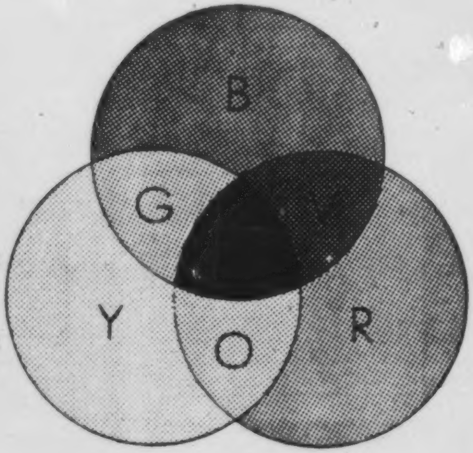
PRIMARY COLORS



LAWS OF COLOR FOR OPAQUE OBJECTS

1. The color of an opaque object is the same color that it reflects. It absorbs all other colors.
2. White objects reflect all colors and absorb none.
3. Black objects reflect no colors and absorb all.

PRIMARY PIGMENTS



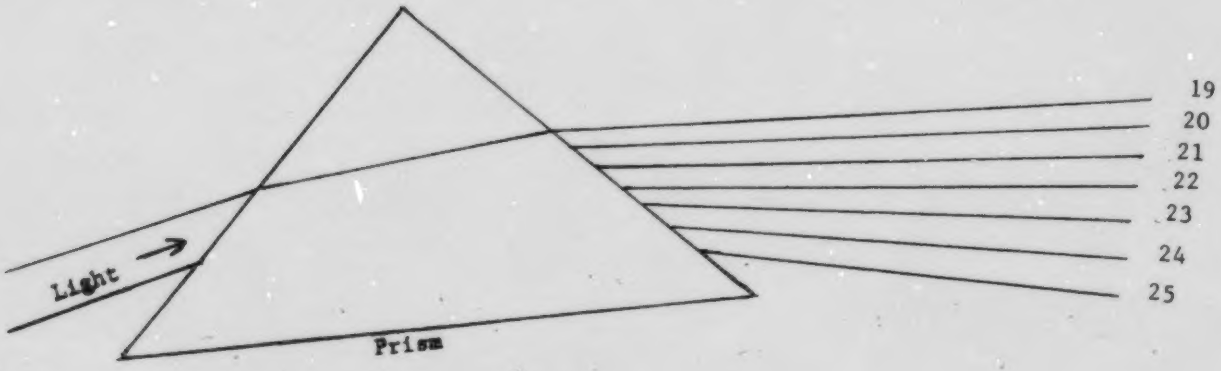
TGT WORKSHEET: III.4 Producing Color

Red, blue, and yellow are the primary ___________. 1	When red, blue and yellow paint are mixed the result is _________________. 2	When blue and yellow paint are mixed, the result is _________________. 3
When yellow and red paint are mixed, the result is _________________. 4	When blue and red paint are mixed, the result is _________________. 5	When sunlight falls on red paint, the paint absorbs all color except ___________. 6
When all colors are reflected by an opaque object, the resultant is __________. 7	When all color is absorbed by an opaque object, the resultant is _____________. 8	Red, blue, and green are the primary __________. 9
When red, blue and green light are mixed, the result is ________________. 10	When red and blue light are mixed, the result is ______. 11	When red and green light are mixed, the result is ______. 12
What system does a color T.V. use? 13	When red light falls on white paper, the result is the color ____________. 14	When red light falls on red paper, the result is ______. 15

TGT WORKSHEET: III.4 Producing Color

When red light falls on blue paper, the result is ________________. 16	When red light falls on black paper, the result is ________. 17	When red light falls on orange paper, the result is _________. 18

19-25 - Name the colors of the spectrum from the longest to the shortest wave length.



19.

20.

21.

22.

23.

24.

25.

26. A prism uses the process known as ______________________________ to break light up into its colors.

27. When green and red are mixed together, they produce yellow in the _____________________ system.

28. When yellow and red are mixed together, they produce orange in the _____________________ system.

WORKSHEET ANSWERS

III.4 Producing Color

1. pigments
2. black
3. green
4. orange
5. violet
6. red
7. white
8. black
9. colors
10. white
11. violet
12. yellow
13. primary colors
14. red
15. red
16. black
17. black
18. red
19. red
20. orange
21. yellow
22. green
23. blue
24. indigo
25. violet
26. refraction
27. additive
28. subtractive

TGT GAMESHEET: III.4--Producing Color

Red, blue, and yellow are the primary ________. 1

When yellow and red paint are mixed, the result is ________. 2

When all colors are reflected by an opaque object, the resultant is ________. 3

When red, blue and green light are mixed, the result is ________. 4

What system does a color T.V. use? ________ 5

When red light falls on blue paper, the result is ________. 6

When red, blue and yellow paint are mixed the result is ________. 7

When blue and red paint are mixed, the result is ________. 8

When all color is absorbed by an opaque object, the resultant is ________. 9

When red and blue light are mixed, the result is ________. 10

When red light falls on white paper, the result is the color ________. 11

When red light falls on black paper, the result is ________. 12

When blue and yellow paint are mixed, the result is ________. 13

When sunlight falls on red paint, the paint absorbs all color except ________. 14

Red, blue, and green are the primary ________. 15

When red and green light are mixed, the result is ________. 16

When red light falls on red paper, the result is ______. 17

When red light falls on orange paper, the result is ________. 18

The color of the spectrum that has the longest wave length. 19

The color of the spectrum that has the second-longest wave length. 20

The color of the spectrum that has the third-longest wave length. 21

The color of the spectrum that has the fourth-longest wave length. 22

The color of the spectrum that has the third-shortest wave length. 23

The color of the spectrum that has the second-shortest wave length. 24

The color of the spectrum that has the shortest wave length. 25

A prism uses the process known as ________ to break light up into its colors. 26

When green and red are mixed together, they produce yellow in the ________ system. 27

When yellow and red are mixed together, they produce orange in the ______ system. 28

GAMESHEET ANSWERS

III.4 Producing Color

1. pigments
2. orange
3. white
4. white
5. primary colors
6. black
7. black
8. violet
9. black
10. violet
11. red
12. black
13. green
14. red
15. colors
16. yellow
17. red
18. red
19. red
20. orange
21. yellow
22. green
23. blue
24. indigo
25. violet
26. refraction
27. additive
28. subtractive

TGT PHYSICAL SCIENCE

UNIT: Light and Sound

WORKSHEET: Light Vocabulary

Objective: III.5 Students will define words necessary for understanding the nature of light.

Instructions: This worksheet will help you prepare for the Light Vocabulary Game. Use the word list and write the correct word in the space below the definition or diagram. The same words and definitions will be used in the game.

Vocabulary:

angle of incidence
angle of reflection
concave lens
converging
convex lens
diffraction grating
diffused
diverging
fluorescent
focal length
focal point
foot-candle
illumination
incandescence
incident ray
index of refraction
intensity
luminous
mirage
normal line
opaque
photometer
photon
radiometer
ray
real image
reflected ray
refraction
spectrum
virtual image

TGT WORKSHEET: III.5 Light Vocabulary

An optical illusion in the atmosphere caused by refraction of light.

1

Ratio of the speed of light in a vacuum to its speed in a given transparent substance.

2

A body which gives off light is a __________ body.

3

The bundles of energy which make up light.

4

Image that can be projected on a screen in an inverted position.

5

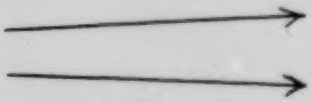
The rays of light that are scattered in different directions.

6

An instrument which changes radiant (light) energy into mechanical energy.

7

Are the rays converging or diverging?

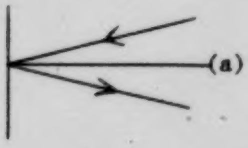


8

Unit used to measure illumination.

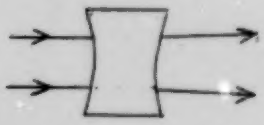
9

What is line (a) called?



10

This is a __________ lens.

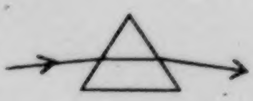


11

Brightness of a light source.

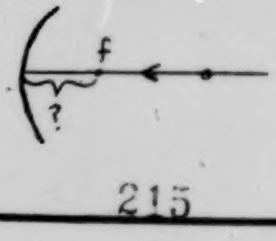
12

In this diagram the ray has been __________.



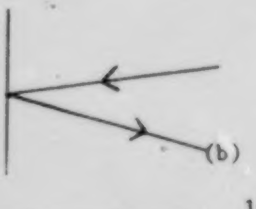
13

The distance from the focus point to the mirror.



14

What is ray (b) called?



15

TGT WORKSHEET: III.5 Light Vocabulary

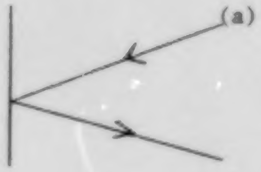
Instrument for measuring light intensity.

16

Glowing or white with heat.

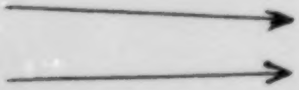
17

What is ray (a) called?



18

Are the rays converging or diverging?



19

Light being reflected by an object.

20

Material used in a spectroscope to produce a spectrum.

21

Any substance through which light cannot pass.

22

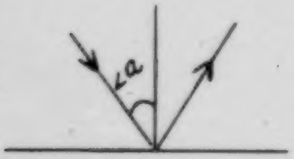
An imaginary line used to show the behavior of light.

23

An image formed by a lens or mirror that cannot be projected on a screen.

24

What is the name of ∠a?

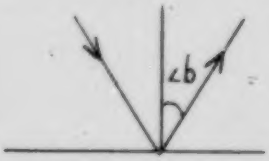


25

The bank of visible colors formed by the spreading out of light through a prism.

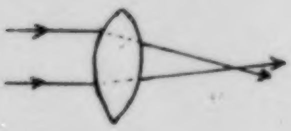
26

What is the name of ∠b?



27

This is an example of a __________ lens.

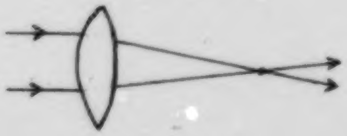


28

The property of a certain substance to give off light when it is exposed to certain radiations.

29

What is the name of the point?



30

WORKSHEET ANSWERS

III.5 Light Vocabulary

1. mirage
2. index of refraction
3. luminous
4. photon
5. real image
6. diffused
7. radiometer
8. diverging
9. foot-candle
10. normal line
11. concave
12. intensity
13. refracted
14. focal length
15. reflected ray
16. photometer
17. incandescent
18. incident ray
19. converging
20. illumination
21. diffraction grating
22. opaque
23. ray
24. virtual image
25. angle of incidence
26. spectrum
27. angle of reflection
28. convex
29. fluorescent
30. focal point

TGT GAMESHEET: III.5 Light Vocabulary

An optical illusion in the atmosphere caused by refraction of light. 1	Brightness of a light source. 2	Any substance through which light cannot pass. 3
Ratio of the speed of light in a vacuum to its speed in a given transparent substance. 4	The bending of a ray of light as it passes at an angle from one transparent material into another. 5	An imaginary line used to show the behavior of light. 6
A body which gives off light is a __________ body. 7	Distance from a mirror or lens to its principle focus. 8	An image formed by a lens or mirror that cannot be projected on a screen. 9
The bundles of energy which make up light. 10	The ray of light which is returned from the reflecting surface. 11	Angle at which light strikes an object. 12
Image that can be projected on a screen in an inverted position. 13	Instrument for measuring light intensity. 14	The band of visible colors formed by the spreading out of light through a prism. 15
The rays of light that are scattered in different directions. 16	Glowing or white with heat. 17	Angle at which light is reflected from an object. 18
Rays which are moving or being directed away from each other. 19	The ray of light which comes from the source of light. 20	A lens which is thicker in the center than at its edges. 21
Unit used to measure illumination 22	Rays which are moving or being directed toward each other. 23	The property of a certain substance to give off light when it is exposed to certain radiations. 24
The line which forms a right angle to the reflecting or refracting surface. 25	Light being reflected by an object. 26	The point to which a lens or mirror converges parallel rays of light. 27
A lens which is thicker at its edges than in the center. 28	Device used in a spectroscope to produce a spectrum. 29	An instrument which changes radiant (light) energy into mechanical energy. 30

GAMESHEET ANSWERS

III.5 Light Vocabulary

1. mirage
2. intensity
3. opaque
4. index of refraction
5. refraction
6. ray
7. luminous
8. focal point
9. virtual image
10. photon
11. reflected ray
12. angle of incidence
13. real image
14. photometer
15. spectrum
16. diffused
17. incandescent
18. angle of reflection
19. diverging rays
20. incident ray
21. convex lens
22. foot-cnadle
23. converging
24. fluorescence
25. normal line
26. illumination
27. focal point
28. concave lens
29. diffraction grating
30. radiometer

TGT PHYSICAL SCIENCE

UNIT: Light and Sound

WORKSHEET: Waves and the Ear

Objective: III.6--a. Students will distinguish between waves and their parts.

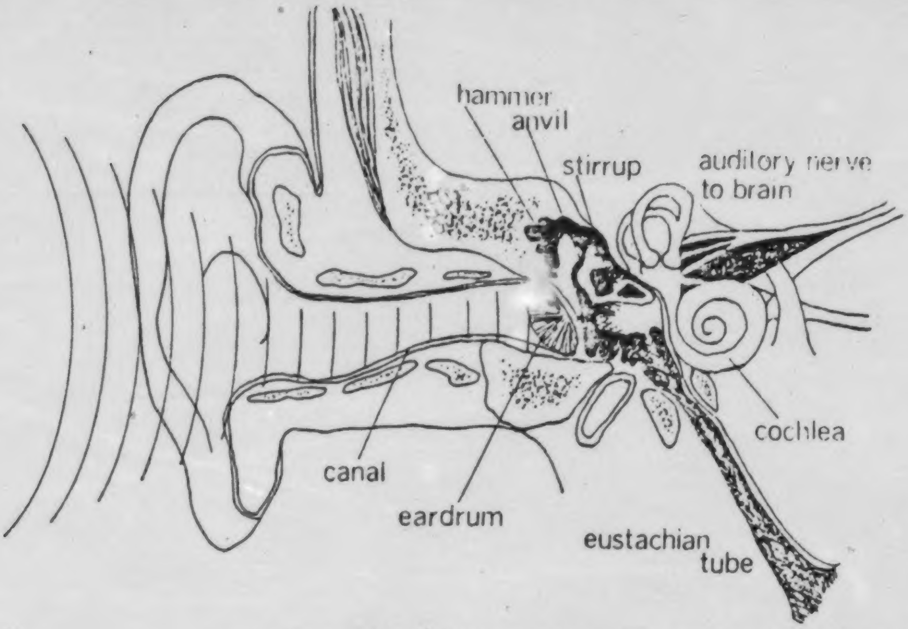
b. Students will identify parts of the ear and their function.

c. Students will distinguish between frequency and pitch.

Instructions: The worksheet will help you prepare for the Waves and the Ear Game. In numbers 1-16, name the part. In numbers 17-28, answer the questions concerning waves. Use the information sheet that is provided.

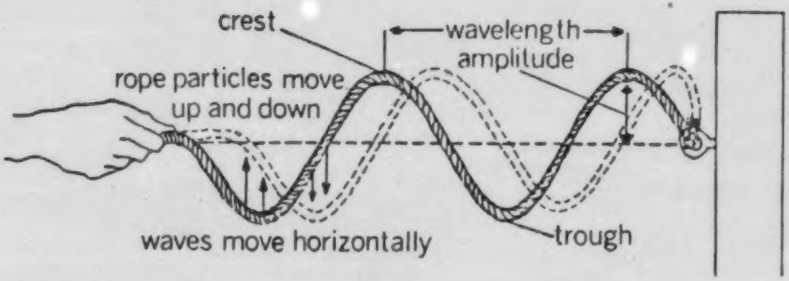
Vocabulary:

amplitude
compression
frequency
longitudinal wave
pitch
rarefaction
transverse wave
wave length

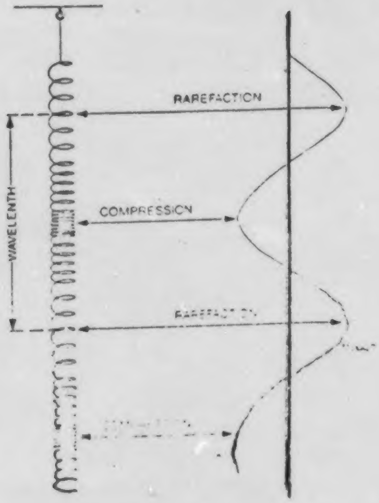

hammer
anvil
stirrup
auditory nerve to brain
cochlea
canal
eardrum
eustachian tube

The important parts of the ear are inside the head. There, sound waves that beat against the eardrum are turned into nerve signals that travel along the auditory nerve to the brain.

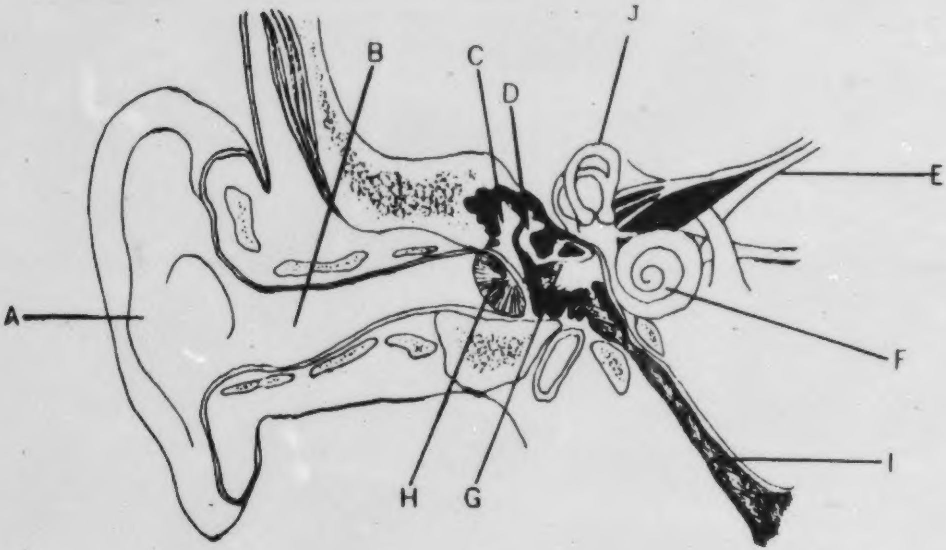
WAVE MOTION AND SOUND


crest
wavelength
amplitude
rope particles move up and down
waves move horizontally
trough

Compressions in a longitudinal wave (left) may be compared to crests in a transverse wave (right).


RAREFACTION
WAVELENTH
COMPRESSION
RAREFACTION

TGT WORKSHEET: III.6 Waves and the Ear



In the diagram part "A" is: ____________________ 1

In the diagram part "B" is: ____________________ 2

In the diagram part "C" is: ____________________ 3

In the diagram part "D" is: ____________________ 4

In the diagram part "E" is: ____________________ 5

In the diagram part "F" is: ____________________ 6

In the diagram part "G" is: ____________________ 7

In the diagram part "H" is: ____________________ 8

In the diagram part "I" is: ____________________ 9

Carries impulses from the inner ear to the brain. ____________________ 10

Large part that collects sound waves. ____________________ 11

Changes physical vibrations into nerve impulses to be sent to the brain. ____________________ 12

Turns sound energy into physical vibrations. ____________________ 13

Small bone that makes physical contact with the cochlea. ____________________ 14

Small bone that picks up the physical vibration from the eardrum. ____________________ 15

A wave that vibrates parallel to its axis. ____________________ 16

A wave that vibrates perpendicular to its axis. ____________________ 17

A sound wave is considered a ____________________ wave. 18

TGT WORKSHEET: III.6 Waves and the Ear

The top of a transverse wave is called the:

____

19

The trough of a transverse wave would compare with a ________________ in a longitudinal wave.

20

If you change the wave length of a sound wave you will change the ________________ of the sound.

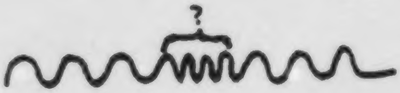
21

If you change the amplitude of a sound wave you will change the ______________ of a sound.

22

Name this part of a longitudinal wave.

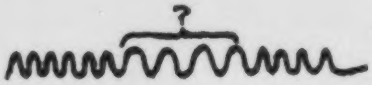
____



23

Name this part of a longitudinal wave.

____



24

If the wave length of a wave is shortened, the pitch will be ________________________

25

A low note has a ____________ frequency than a high note

26

In the diagram part "J" is:

____

27

The distance from a point on one wave to the exact same point on the next wave is called ___________________.

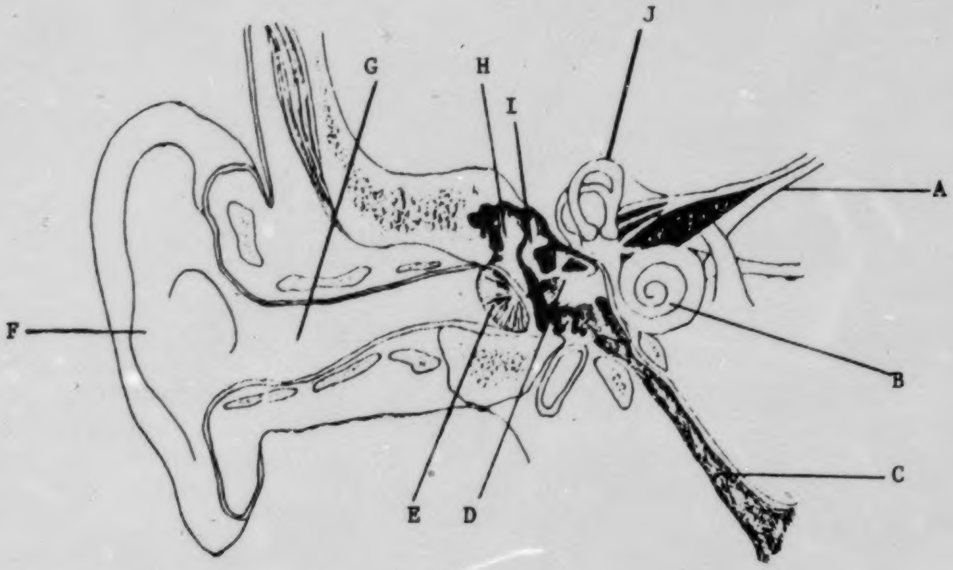
28

WORKSHEET ANSWERS

III.6 Waves and the Ear

1. outer ear
2. ear canal
3. hammer
4. anvil
5. auditory nerve
6. cochlea
7. stirrup
8. eardrum
9. eustachian tube
10. auditory nerve
11. outer ear
12. cochlea
13. ear drum
14. stirrup
15. hammer
16. longitudinal wave
17. transverse
18. longitudinal
19. crest
20. rarefaction
21. pitch
22. volume
23. compression
24. rarefaction
25. higher
26. lower
27. semicircular canal
28. a wavelength

TGT GAMESHEET: III.6 Waves and the Ear



In the diagram part "A" is: ______________ 1	In the diagram part "B" is: ______________ 2	In the diagram part "C" is: ______________ 3
In the diagram part "D" is: ______________ 4	In the diagram part "E" is: ______________ 5	In the diagram part "F" is: ______________ 6
In the diagram part "G" is: ______________ 7	In the diagram part "H" is: ______________ 8	In the diagram part "I" is: ______________ 9
Carries impulses from the inner ear to the brain. ______________ 10	Large part that collects sound waves. ______________ 11	Changes physical vibrations into nerve impulses to be sent to the brain. ______________ 12
The distance from a point on one wave to the exact same point on the next wave is called ______________. 13	Small bone that picks up the physical vibration from the eardrum. ______________ 14	Small bone that makes physical contact with the cochlea. ______________ 15
Turns sound energy into physical vibrations. ______________ 16	A sound wave is considered a ______________ wave. 17	A wave that vibrates perpendicular to its axis. ______________ 18

TGT GAMESHEET: III.6 Waves and the Ear

A wave that vibrates parallel to its axis.

____

19

If you change the wave length of a sound wave you will change the ________________ of the sound.

20

The trough of a transverse wave would compare with a ________________ in a longitudinal wave.

21

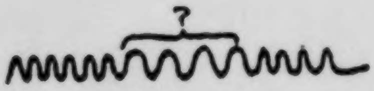
The top of a transverse wave is called the:

____

22

Name this part of a longitudinal wave.

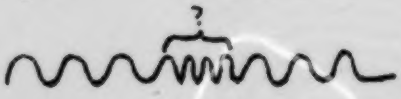
____



23

Name this part of a longitudinal wave.

____



24

If you change the amplitude of a sound wave you will change the ________________ of a sound.

25

In the diagram part "J" is:

____

26

A low note has a ________________ frequency than a high note.

27

If the wave length of a wave is shortened the pitch will be:

____

28

GAMESHEET ANSWERS

III.6 Waves and the Ear

1. auditory nerve
2. cochlea
3. eustachian tube
4. stirrup
5. eardrum
6. outer ear (pinna)
7. ear canal
8. hammer
9. anvil
10. auditory nerve
11. outer ear
12. cochlea
13. a wavelength
14. hammer
15. stirrup
16. eardrum
17. longitudinal
18. transverse wave
19. longitudinal wave
20. pitch
21. rarefaction
22. crest
23. rarefaction
24. compression
25. volume
26. semicircular canals
27. lower
28. higher

TGT PHYSICAL SCIENCE

UNIT: Light and Sound

WORKSHEET: Sound Vocabulary Review

Objective: III.7--Students will define the basic words needed to understand the relationship between waves and sound.

Instructions: This worksheet will help you prepare for the Sound Vocabulary Review Game. Choose a vocabulary word from the list below for each definition that is given.

Vocabulary:

acoustics
amplify
amplitude
auditory
compression
crest
cycle
decibel
echo
fidelity
frequency
hearing
intensity
interference
longitudinal wave
noise
pitch
rarefaction
resonate
sonar
sound
transverse wave
tones
trough
ultrasonic
vibration
wave length

TGT WORKSHEET: III.7 Sound Vocabulary Review

The distance from one wave crest to the next wave crest in a series of waves. 1	A wave that vibrates perpendicular to its axis. 2	A wave that vibrates parallel to its axis. 3
The number of vibrations per second. 4	The distance from the axis to the top of a wave. 5	The top of a wave. 6
The bottom of a wave. 7	Part of a sound wave where the molecules have spread out. 8	Part of a sound wave where the molecules are bunched together. 9
The highness or lowness of a note on a sound scale. This is caused by the frequency of the sound. 10	Sounds with a frequency higher than those detected by the human ear. 11	Sound Navigation and Ranging: a method used for locating objects in water. 12
The regular back-and-forth movement of matter. 13	A complete vibration. 14	To increase the loudness of a sound. 15

TGT WORKSHEET: III.7 Sound Vocabulary Review

A reflected sound. 16	The silence that results when one sound wave whose air molecules are compressed bumps into another sound wave whose air molecules are spread out. 17	Make sounds louder by a sympathetic vibration. 18
The degree of loudness of sound. 19	The science of detecting and controlling sound. 20	Having to do with the sense of hearing. 21
A unit used to measure the loudness of sound. 22	Sounds made up of definite and regular frequencies. 23	The accurate reproduction of sound by a recording. 24
Any vibration that is detected by the human ear. 25	The detection of vibrations. 26	Sounds caused by vibrations which are not regular. 27

WORKSHEET ANSWERS

III.7 Sound Vocabulary Review

1. wavelength
2. transverse wave
3. longitudinal wave
4. frequency
5. amplitude
6. crest
7. trough
8. rarefaction
9. compression
10. pitch
11. ultrasonic
12. sonar
13. vibration
14. cycle
15. amplify
16. echo
17. interference
18. resonate
19. intensity
20. acoustics
21. auditory
22. decibel
23. tones
24. fidelity
25. sound
26. hearing
27. noise

TGT GAMESHEET: III.7 Sound Vocabulary Review

The distance from one wave crest to the next wave crest in a series of waves. 1	The number of vibrations per second. 2	The bottom of a wave. 3
The highness or lowness of a note on a sound scale. This is caused by the frequency of the sound. 4	The regular back-and-forth movement of matter. 5	A wave that vibrates perpendicular to its axis. 6
The distance from the axis to the top of a wave. 7	Part of a sound wave where the molecules have spread out. 8	Sounds with a frequency higher than those detected by the human ear. 9
A complete vibration. 10	A wave that vibrates parallel to its axis. 11	The top of a wave. 12
Part of a sound wave where the molecules are bunched together. 13	Sound Navigation and Ranging: a method used for locating objects in water. 14	To increase the loudness of a sound. 15
A reflected sound. 16	The degree of loudness of sound. 17	A unit of sound loudness. 18
Any vibration that is detected by the human ear. 19	The silence that results when one sound wave whose air molecules are compressed bumps into another sound wave whose air molecules are spread out. 20	The science of detecting and controlling sound. 21
Sounds made up of definite and regular frequencies. 22	The detection of vibrations. 23	Make sounds louder by a sympathetic vibration. 24
Having to do with the sense of hearing. 25	The accurate reproduction of a sound by a recording. 26	Sounds caused by vibrations which are not regular. 27

GAMESHEET ANSWERS

III.7 Sound Vocabulary Review

1. wavelength
2. frequency
3. trough
4. pitch
5. vibration
6. transverse wave
7. amplitude
8. rarefaction
9. ultrasonic
10. cycle
11. longitudinal wave
12. crest
13. compression
14. sonar
15. amplify
16. echo
17. intensity
18. decibel
19. sound
20. interference
21. acoustics
22. tones
23. hearing
24. resonate
25. auditory
26. fidelity
27. noise

TGT PHYSICAL SCIENCE

UNIT: Heat Energy

WORKSHEET: Heat Transfer

Objective: IV.1--a. Students will identify and distinguish among the methods of heat transfer.

b. Students will define the terms insulator and conductor.

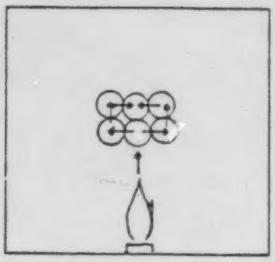
c. Students will identify substances that conduct and insulate against heat.

Instructions: This worksheet will help you prepare for the Heat Transfer Game. In items 1-21, read the statement and pick the main method of heat transfer involved. In items 22-28, identify the substance as an insulator or conductor.

Vocabulary:

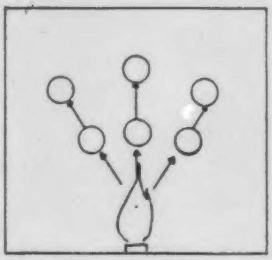
conduction
conductor
convection
insulator
radiation

TGT WORKSHEET: IV.1 Heat Transfer



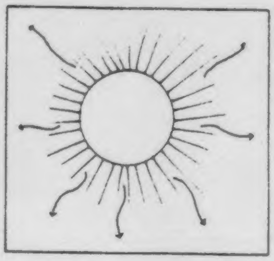
conduction:

heat moves from one particle to another



convection:

particles carry heat



radiation:

heat waves move through empty space

The sun makes you feel warm. 1	Your body is warmed by a sunlamp. 2	Smoke and hot air going up a chimney. 3
The handle of a sauce pan gets hot. 4	Currents or movement of water in a pan when heating it. 5	The outside of the pipe bringing hot water to the sink becomes hot when hot water flows through it. 6
A tin cup gets hot when coffee is put into it. 7	Being warmed by standing in front of a fireplace. 8	Meat being heated in a frying pan. 9
Produces winds. 10	Can be controlled or stopped by the use of mirrors. 11	Keeping the window open for ventilation. 12
The roof of a car gets very hot when it sits in the sunlight. 13	Outside of a dish gets hot when filled with hot food. 14	A pinwheel over a candle starts to spin as a result of air movement. 15
Cooking a hot dog over a campfire. 16	Using a hot water bottle or heating pad. 17	On a bright sunny day the pavement gets very hot. 18

TGT WORKSHEET: IV.1 Heat Transfer

Heat being transferred in water by currents. 19	The primary method of heat transfer in a fluid. 20	Transfer of heat by direct contact between molecules. 21
Substances that transfer heat easily. 22	Substances that do not transfer heat easily. 23	Plastics a. insulator b. conductor 24
Aluminum a. insulator b. conductor 25	Paper a. insulator b. conductor 26	Wood a. insulator b. conductor 27
Iron a. insulator b. conductor 28		

WORKSHEET ANSWERS

Heat Transfer

1. radiation
2. radiation
3. convection
4. conduction
5. convection
6. conduction
7. conduction
8. convection
9. conduction
10. convection
11. radiation
12. convection
13. radiation
14. conduction
15. convection
16. radiation
17. conduction
18. radiation
19. radiation
20. convection
21. conduction
22. conductors
23. insulators
24. insulator
25. conductor
26. insulator
27. insulator
28. conductor

TGT GAMESHEET: IV.1 Heat Transfer

The sun makes you feel warm. 1	Meat being heated in a frying pan. 2	The primary method of heat transfer in a fluid. 3
The handle of a sauce pan gets hot. 4	Keeping the window open for ventilation. 5	Substances that do not transfer heat easily. 6
A tin cup gets hot when coffee is put into it. 7	The roof of a car gets very hot when it sits in the sunlight. 8	Paper a. insulator b. conductor 9
Produces winds 10	Cooking a hot dog over a campfire. 11	A pinwheel over a candle starts to spin as a result of air movement. 12
Your body is warmed by a sun lamp. 13	Heat being transferred in water by currents. 14	On a bright sunny day the pavement gets hot. 15
Movement of water in a saucepan when heating it. 16	Substances that transfer heat easily. 17	Transfer of heat by direct contact of molecules. 18
Being warmed by standing in front of a fireplace. 19	Aluminum a. insulator b. conductor 20	Glass a. insulator b. conductor 21
Can be controlled or stopped by the use of mirrors. 22	Iron a. insulator b. conductor 23	Wood a. insulator b. conductor 24
Smoke and hot air going up a chimney. 25	Outside of a dish gets hot when filled with hot food. 26	The outside of the pipe bringing hot water to the sink becomes hot when hot water flows through it. 27
Using a hot water bottle or heating pad. 28		

GAMESHEET ANSWERS

Heat Transfer

1. radiation
2. conduction
3. convection
4. conduction
5. convection
6. insulators
7. conduction
8. radiation
9. insulator
10. convection
11. radiation
12. convection
13. radiation
14. radiation
15. radiation
16. convection
17. conductors
18. conduction
19. radiation
20. conductor
21. conductor
22. radiation
23. conductor
24. insulator
25. convection
26. conduction
27. conduction
28. conduction

TGT PHYSICAL SCIENCE

UNIT: Heat Energy

WORKSHEET: Heat and Temperature

Objective: IV.2--a. Students will identify common Celsius and Fahrenheit temperatures.

b. Students will convert readings from one temperature scale to the other.

c. Students will compute heat energy loss and gain.

Instructions: This worksheet will help you prepare for the Heat and Temperature Game. You are provided with a diagram and statement sheet for the worksheet only. Read each item and write the answer on the worksheet.

Vocabulary:

calorie
degree
heat energy
heat of fusion
heat of vaporization
temperature

DIAGRAM A

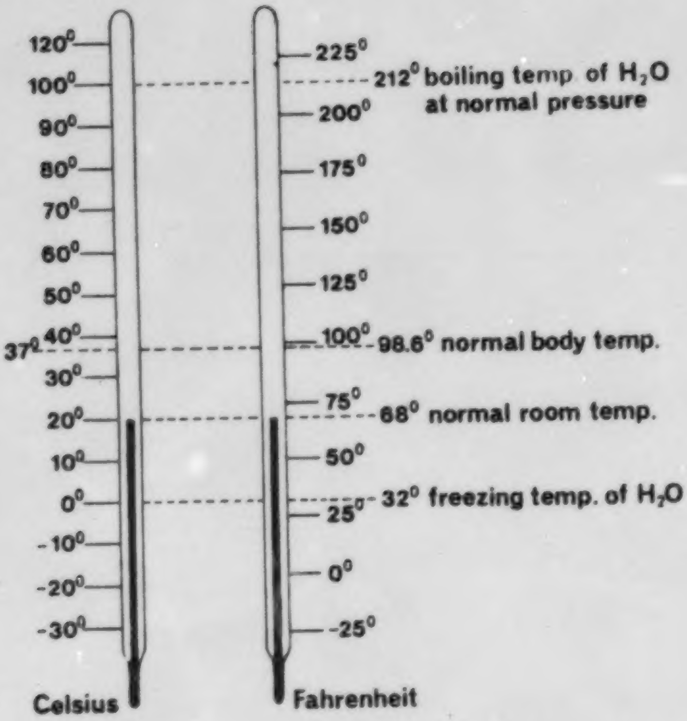
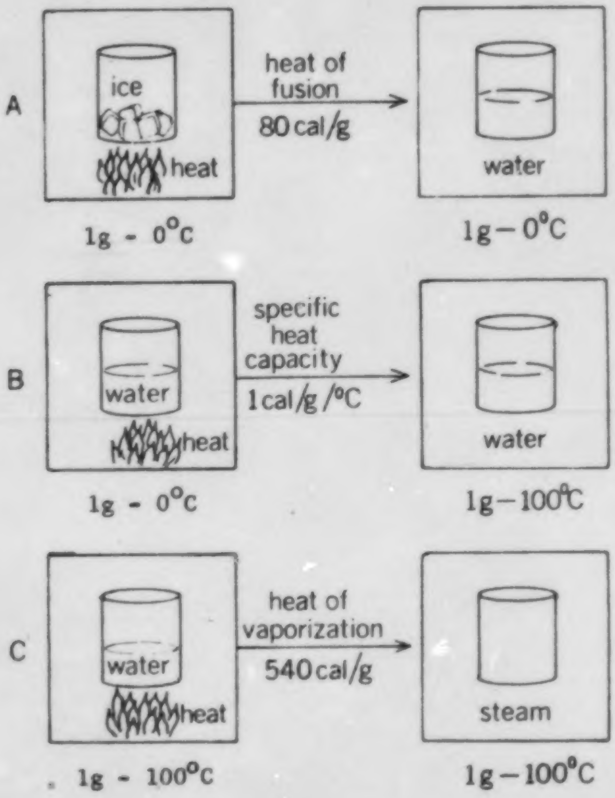

120°
100°
90°
80°
70°
60°
50°
40°
37°
30°
20°
10°
0°
-10°
-20°
-30°
Celsius
225°
212° boiling temp of H_2O at normal pressure
200°
175°
150°
125°
100°
98.6° normal body temp.
75°
68° normal room temp.
50°
32° freezing temp. of H_2O
25°
0°
-25°
Fahrenheit

DIAGRAM B


A
ice
heat
heat of fusion
80 cal/g
water
1g - 0°C
1g – 0°C
B
water
heat
specific heat capacity
1 cal/g/°C
water
1g - 0°C
1g – 100°C
C
water
heat
heat of vaporization
540 cal/g
steam
1g - 100°C
1g – 100°C

Statements

A. Temperature is the measurement of the average molecular motion or kinetic energy in a substance.

B. Heat is the measurement of the total energy in a substance.

C. A calorie is the amount of heat energy required to raise the temperature of 1 gram of water by one degree celsius.

TGT WORKSHEET: IV.2 Heat and Temperature

How many Celsius degrees are between the freezing and boiling point of water? 1	How many Fahrenheit degrees are between the freezing and boiling point of water? 2	Normal body temperature is _____° C, according to Diagram A. 3
Normal room temperature is _______° C, according to Diagram A. 4	Normal body temperature is _______° F, according to Diagram A. 5	Normal room temperature is _____° F, according to Diagram A. 6
For every 5° change on the Celsius scale, there will be a _______° change on the Fahrenheit scale. 7	Would 40° C be comfortable in the summer? 8	What would 40° C be equal to on the Fahrenheit scale? 9
Would water freeze at 14° F? 10	What would 14° F be equal to on the Celsius scale? 11	Temperature is the __________ molecular motion in a substance. 12
Heat energy is the _______ molecular motion in a substance. 13	The metric unit used to measure heat energy is the __________. 14	The unit used to measure temperature is the _________. 15
The heat of fusion of water is _________. 16	The heat of vaporization of water is _________. 17	According to Diagram B, it requires _______ calories to change 1 gram of ice at 0° C to 1 gram of water at 0° C. 18
According to Diagram B, it requires _______ calories to change 1 gram of water at 100° C to steam at 100° C. 19	How many calories would be required to change 10 grams of ice at 0° C to water at 0° C? 20	How many calories would be required to change 10 grams of water at 100° C to steam at 100° C? 21
It requires how many calories to raise 1 gram of water 1° C? 22	It would require ______ calories to raise 100 grams of water 20 Celsius degrees. 23	It would require ______ calories to raise 10 grams of water 50 Celsius degrees. 24
The point of _______ would be the temperature at which a substance is at its melting point. 25	The temperature at which a substance turns to a gas is its _________ point or temperature. 26	The temperature at which water melts or freezes is _______. 27
The temperature at which water vaporizes is _______. 28		

WORKSHEET ANSWERS

IV.2 Heat and Temperature

1. 100°
2. 180°
3. 37°
4. 20°
5. 98.6°
6. 68°
7. 9°
8. No
9. 104°
10. Yes
11. -10°
12. average
13. total
14. calorie
15. degree
16. 80 c/g
17. 540 c/g
18. 80
19. 540
20. 800
21. 5400
22. 1
23. 2,000
24. 500
25. fusion
26. vaporization
27. 0° C or 32° F
28. 100° C or 212° F

TGT GAMESHEET: IV.2 Heat and Temperature

The temperature at which water melts or freezes. 1	What would 40° C be equal to on the Fahrenheit scale? 2	Normal room temperature is _______° C. 3
What would 14° F be equal to on the Celsius scale? 4	Normal body temperature is _______° F. 5	The point of ______ would be the temperature at which a substance turns to a gas. 6
Normal body temperature is _____° C. 7	How many Celsius degrees are there between the freezing and boiling points of water? 8	It requires _____ calories to change 1 gram of water at 100° to steam at 100° C. 9
Heat energy is the _______ molecular motion in a substance. 10	Normal room temperature is _____° F. 11	It would require ______ calories to raise 100 grams of water 20 Celsius degrees. 12
How many calories would be required to change 10 grams of ice at 0° C to water at 0° C? 13	How many Fahrenheit degrees are between the freezing and boiling points of water? 14	The point of _______ would be the temperature at which a substance is at its melting point. 15
Would water freeze at 14° F? 16	It requires _____ calories to change 1 gram of ice at 0° C to 1 gram of water at 0° C. 17	The unit used to measure temperature is the _______. 18
How many calories would be required to change 10 grams of water at 100° C to steam at 100° C? 19	Temperature is the _______ molecular motion in a substance. 20	For every 5° change on the Celsius scale, there will be _______° change on the Fahrenheit scale. 21
The metric unit used to measure heat is the _______. 22	The temperature at which water vaporizes is ______. 23	It would require ______ calories to raise 10 grams of water 50 Celsius degrees. 24
The point of __________ of water would be the point at which it turns to gas. 25	Would 40° C be comfortable in the summer? 26	It requires how many calories to raise 1 gram of water 1° C? 27
The heat of fusion of water is _______. 28		

GAMESHEET ANSWERS

IV.2 Heat and Temperature

1. 0° C or 32° F
2. 104°
3. 20°
4. -10°
5. 98.6°
6. vaporization
7. 37°
8. 100°
9. 540
10. total
11. 68°
12. 2,000
13. 800
14. 180°
15. fusion
16. Yes
17. 80
18. degree
19. 5,400
20. average
21. 9°
22. calorie
23. 100° C or 212° F
24. 500
25. vaporization
26. No
27. 1
28. 80 c/g

TGT PHYSICAL SCIENCE

UNIT: Heat Energy

WORKSHEET: Heat Graphs

Objective: IV.3--a. Students will be able to interpret latent heat factors from a graph.

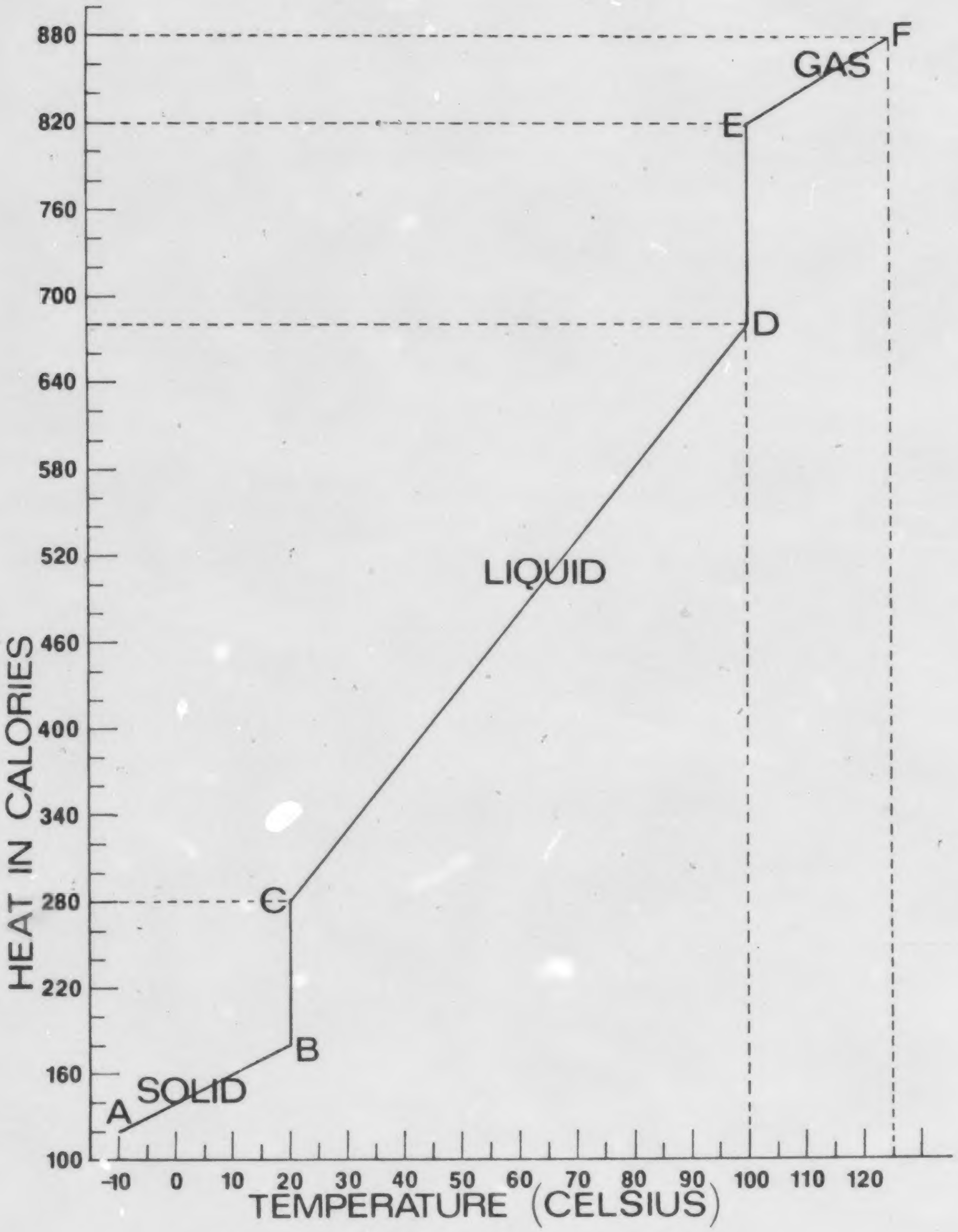
b. Students will be able to identify latent heat points.

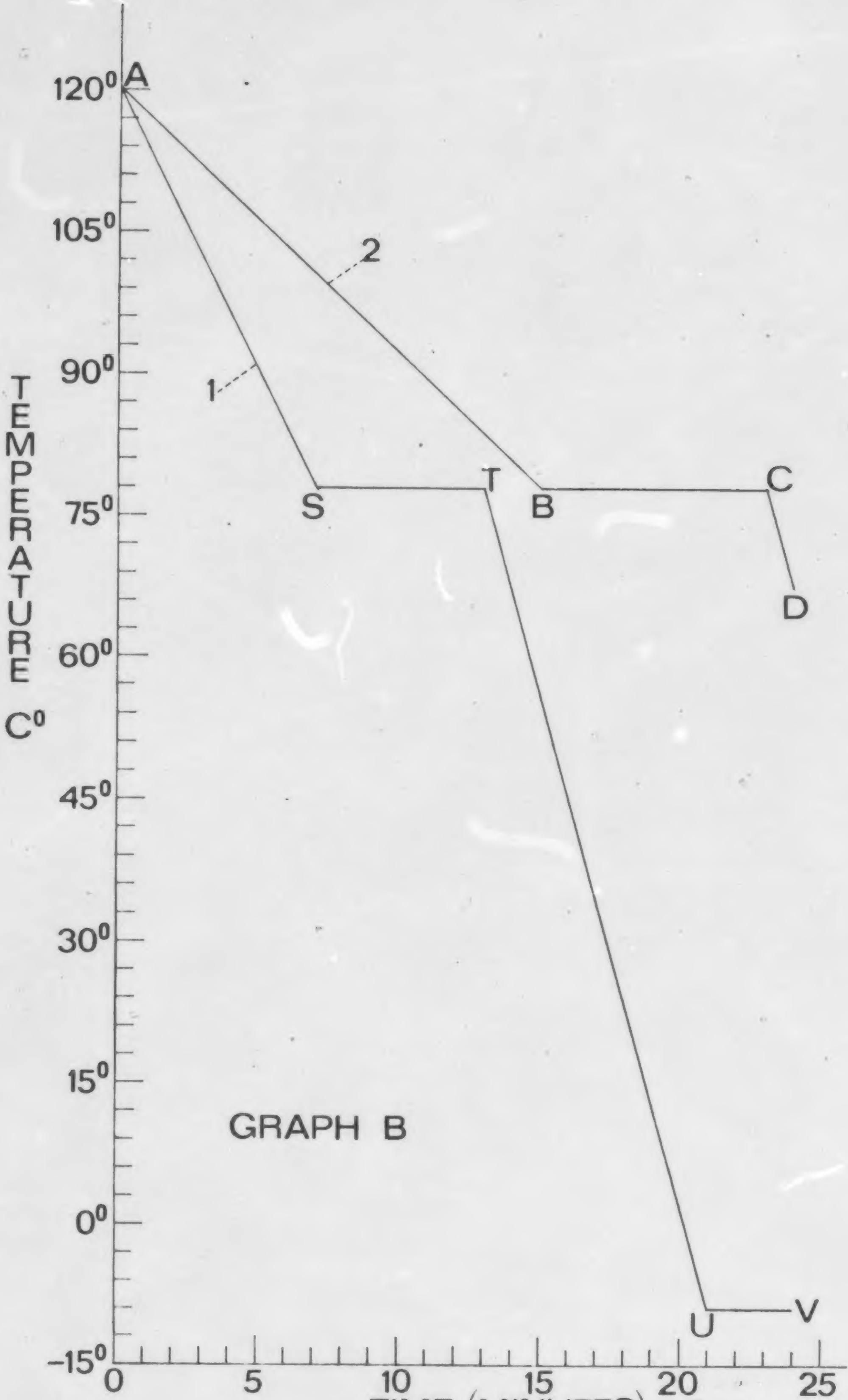
Instructions: This worksheet will help you prepare for the Heat Graph Game. Circle the correct answer or write the answers in the space provided. In numbers 1-15, all graph questions refer to Graph A. In numbers 16-24, all graph questions refer to Graph B.

Vocabulary:

calorie
degree
heat of fusion
heat of vaporization
latent heat
point of fusion
point of vaporization

GRAPH A


880
820
760
700
640
580
520
460
400
340
280
220
160
100
HEAT IN CALORIES
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
TEMPERATURE (CELSIUS)
A
B
C
D
E
F
SOLID
LIQUID
GAS


TEMPERATURE C⁰
120⁰
105⁰
90⁰
75⁰
60⁰
45⁰
30⁰
15⁰
0⁰
–15⁰
0
5
10
15
20
25
TIME (MINUTES)
A
2
1
S
T
B
C
D
U
V
GRAPH B

TGT WORKSHEET: IV.3 Heat Graphs

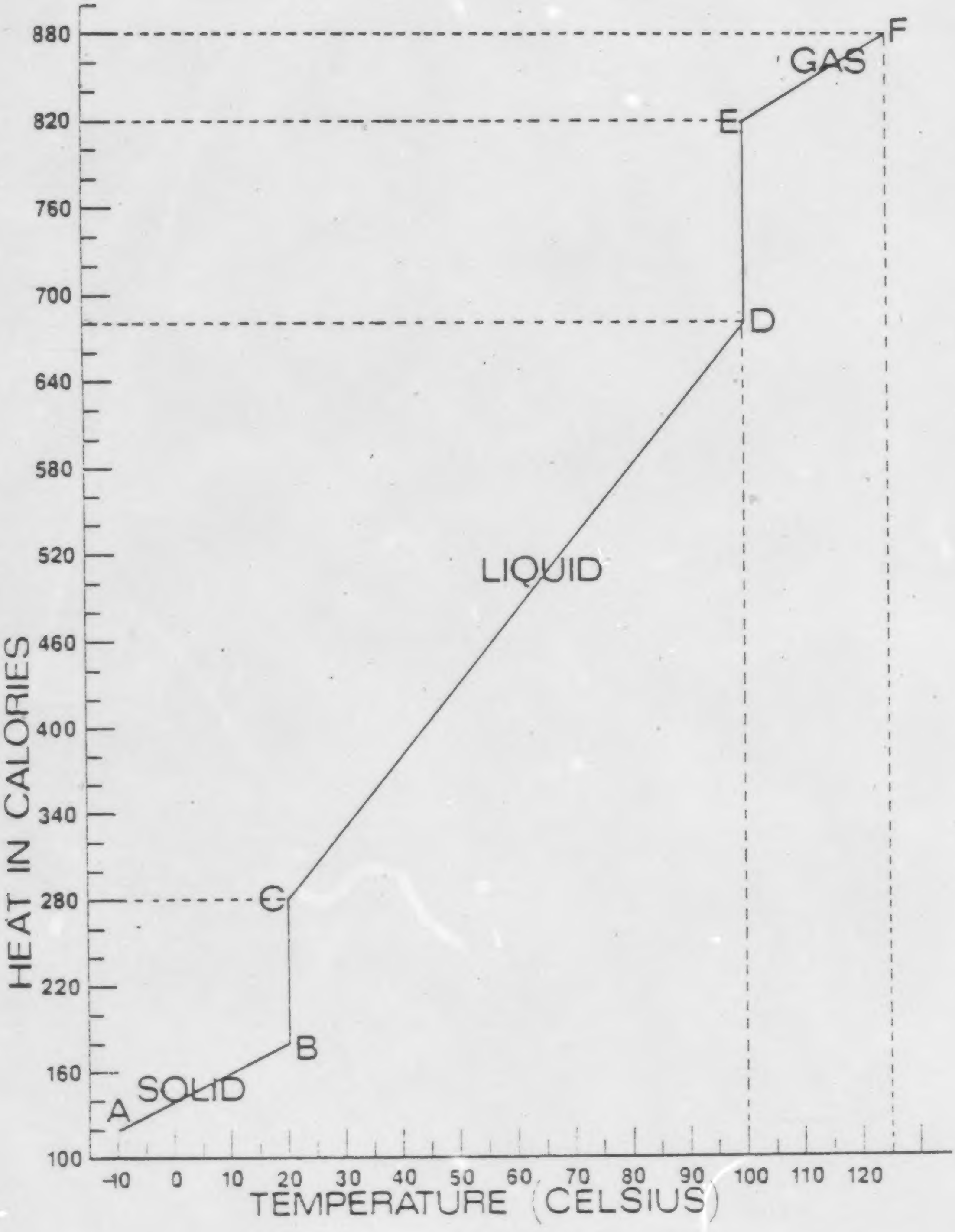
On graph A, what letter stands for the point of fusion? a. B c. F b. D 1	On graph A, what letter stands for the point of vaporization? a. B c. F b. D 2	On graph A, what line segment represents the liquid phase? a. E-F c. A-B b. C-D 3
On graph A, what line segment represents the solid phase? a. E-F c. A-B b. C-D 4	On graph A, what line segment represents the vapor (gas) phase? a. E-F c. A-B b. C-D 5	The substance remained a liquid between the temperatures of _______° C and _______° C. 6
How many calories of heat energy were absorbed during the vaporization process? 7	How many calories were absorbed during the heat of fusion period? 8	What line segment represents the heat of fusion? 9
What line segment represents the heat of vaporization? 10	What was the melting point of the substance? 11	What is the temperature at the boiling point of the substance? 12
In graph A, was the substance being heated or cooled? 13	Heat is measured in units called __________. 14	Temperature is measured in units called __________. 15
In graph B, are the substances heating or cooling? 16	At what temperature did quantity 1 turn from a gas to a liquid? 17	At what temperature did quantity 2 turn from a gas to a liquid? 18
What is the freezing point of quantity 1? 19	What line segment represents the liquid state of the substance in quantity 1? 20	According to the graph, does the quantity change the point of vaporization? 21
The point at which a liquid turns to gas or a gas to a liquid is called __________. 22	If 1 and 2 were different substances, could they be separated by distillation? 23	Which quantity contained the most heat energy? 24

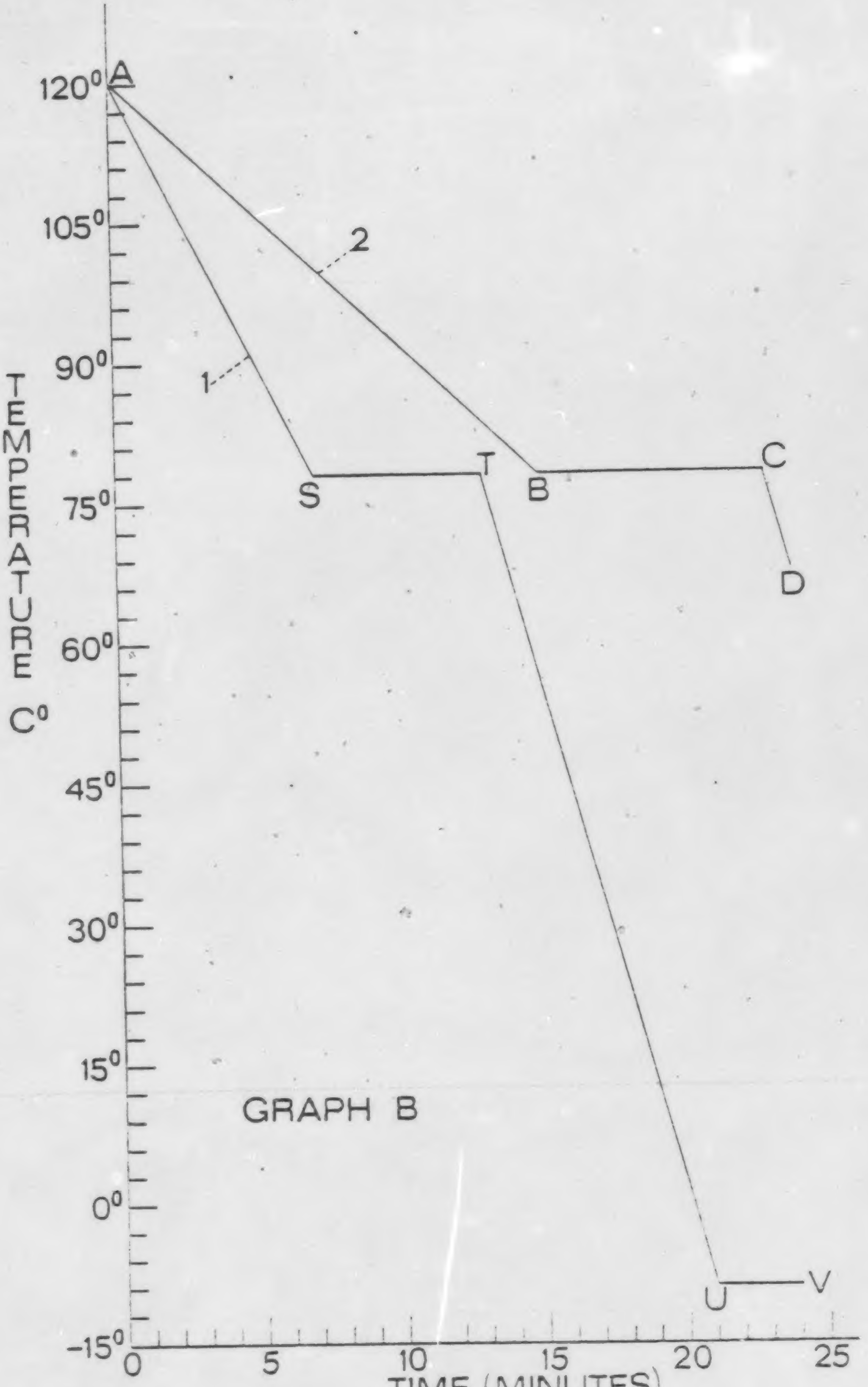
WORKSHEET ANSWERS

IV.3 Heat Graphs

1. a
2. b
3. b
4. c
5. a
6. 20° C and 100° C
7. 140
8. 100
9. B-C
10. D-E
11. 20° C
12. 100° C
13. heated
14. calories
15. degrees
16. cooling
17. 78° C
18. 78° C
19. -9° C
20. T-U
21. No
22. vaporization point
23. No
24. Q2

GRAPH A


HEAT IN CALORIES
880
820
760
700
640
580
520
460
400
340
280
220
160
100
A
SOLID
B
C
LIQUID
D
E
GAS
F
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
TEMPERATURE (CELSIUS)


TEMPERATURE C⁰
120⁰
105⁰
90⁰
75⁰
60⁰
45⁰
30⁰
15⁰
0⁰
-15⁰
0
5
10
15
20
25
TIME (MINUTES)
A
1
2
S
T
B
C
D
U
V
GRAPH B

TGT GAMESHEET: IV.3 Heat Graphs

On graph B, which quantity contained the most heat? 1	Heat is measured in units called ________. 2	On graph A, what line segment represents the heat of fusion? 3
On graph A, what line segment represents the liquid phase? a. E-F c. A-B b. C-D 4	Temperature is measured in units called ________. 5	According to graph B, does the quantity change the point of vaporization? 6
On graph B, if 1 and 2 were different substances, could they be separated by distillation? 7	On graph A, what letter stands for the point of fusion? a. B c. F b. D 8	On graph A, what was the melting point of the substance? 9
On graph B, what line segment represents the liquid state of the substance in quantity 1? 10	On graph B, at what temperature did quantity 2 turn from a gas to a liquid? 11	On graph B, what is the freezing point of quantity 1? 12
On graph A, how many calories were absorbed during the heat of fusion period? 13	On graph A, what line segment represents the solid phase? a. E-F c. A-B b. C-D 14	On graph A, what is the temperature at the boiling point of the substance? 15
On graph A, what line segment represents the vapor (gas) phase? a. E-F c. A-G b. C-D 16	The point at which a liquid turns to gas or a gas to a liquid is called ________. 17	On graph A, the substance remained a liquid between the temperatures of ______ °C and ______ °C. 18
On graph A, what letter stands for the point of vaporization? a. B c. F b. D 19	In graph A, was the substance being heated or cooled? 20	On graph A, what line segment represents the heat of vaporization? 21
On graph B, at what temperature did quantity 1 turn from a gas to a liquid? 22	In graph B, are the substances heating or cooling? 23	On graph A, how many calories were absorbed during the vaporization period? 24

GAMESHEET ANSWERS

IV.3 Heat Graphs

1. Q2
2. calories
3. B-C
4. b
5. degrees
6. No
7. No
8. a
9. 20° C
10. T-U
11. 78° C
12. -9° C
13. 100
14. C
15. 100° C
16. a
17. vaporization point
18. 20° C and 100° C
19. b
20. heated
21. D-E
22. 48° C
23. cooling
24. 140

TGT PHYSICAL SCIENCE

UNIT: Heat Energy

WORKSHEET: Heat Vocabulary Review

Objective: IV.4--Students will define basic terms used in the study of heat energy.

Instructions: This worksheet will help you prepare for the Heat Vocabulary Review Game. After reading the definition on the worksheet, choose the correct term from the vocabulary list and write the term in the space below the proper definition. You will not be provided the vocabulary list for the tournament.

Vocabulary:

absolute zero
boiling point
B.T.U.
calorie
calorimeter
condensation
conduction
conductor
convection
cryogenics
degree
evaporation
heat
heat of fusion
heat of vaporization
insulator
latent heat
radiation
specific heat
temperature
thermometer
thermostat

TGT WORKSHEET: IV.4 Heat Vocabulary Review

Something which prevents the flow of heat. 1	Measurement of the total molecular energy in an object. 2	The change from a liquid to a gas. 3
An instrument for measuring temperature. 4	Transfer of energy in waves through space. 5	Hidden heat. 6
A solid through which heat travels easily. 7	The unit of heat in the English system. The capacity of air conditioners and refrigerators is given in these units. 8	Measurement of the average molecular energy in an object. 9
Lowest temperature theoretically possible. 10	A device that regulates temperature automatically. 11	The temperature at which the inner pressure of a liquid becomes greater than the outer pressure. 12
The movement of heat through a gas or liquid by circulation. 13	The metric unit used to measure heat. 14	The change from a gas to a liquid. 15
The amount of heat needed to change the temperature of one gram of a substance 1° C. 16	Unit used to measure temperature. 17	Amount of heat required to melt one gram of a substance. 18
Instrument used to measure heat in calories. 19	The transfer of heat through a solid. 20	Amount of heat required to change 1 gram of a liquid to a gas. 21
Scientific study of physical and chemical properties at very low temperatures. 22		

WORKSHEET ANSWERS

IV.4 Heat Vocabulary Review

1. insulator
2. heat
3. evaporation
4. thermometer
5. radiation
6. latent heat
7. conductor
8. B.T.U.
9. temperature
10. absolute zero
11. thermostat
12. boiling point
13. convection
14. calorie
15. condensation
16. specific heat
17. degree
18. heat of fusion
19. calorimeter
20. conduction
21. heat of vaporization
22. cryogenics

TGT GAMESHEET: IV.4 Heat Vocabulary Review

A solid through which heat travels easily. 1	The unit of heat in the English system. The capacity of air conditioners and refrigerators is given in these units. 2	Measurement of the average molecular energy in an object. 3
Lowest temperature theoretically possible. 4	A device that regulates temperature automatically. 5	The temperature at which the inner pressure of a liquid becomes greater than the outer pressure. 6
The movement of heat through a gas or liquid by circulation. 7	The metric unit used to measure heat. 8	The change from a gas to a liquid. 9
An instrument for measuring temperature. 10	Transfer of energy in waves through space. 11	Hidden heat. 12
Something which prevents the flow of heat. 13	Measurement of the total molecular energy in an object. 14	The change from a liquid to a gas. 15
Scientific study of physical and chemical properties at very low temperatures. 16	Instrument used to measure heat in calories. 17	The transfer of heat through a solid. 18
Amount of heat required to change 1 gram of a liquid to a gas at the point of vaporization. 19	The amount of heat needed to change the temperature of 1 gram of a substance 1° C. 20	Unit used to measure temperature. 21
Amount of heat required to melt one gram of a substance at the point of fusion. 22		

GAMESHEET ANSWERS

IV.4 Heat Vocabulary Review

1. conductor
2. B.T.U.
3. temperature
4. absolute zero
5. thermostat
6. boiling point
7. convection
8. calorie
9. condensation
10. thermometer
11. radiation
12. latent heat
13. insulator
14. heat
15. evaporation
16. cryogenics
17. calorimeter
18. conduction
19. heat of vaporization
20. specific heat
21. degree
22. heat of fusion

TGT PHYSICAL SCIENCE

UNIT: Electricity

WORKSHEET: What Charge and Why?

Objective: V.1--a. Students will define the terms "negative charge" and "positive charge."

b. Students will determine if an object is negatively or positively charged.

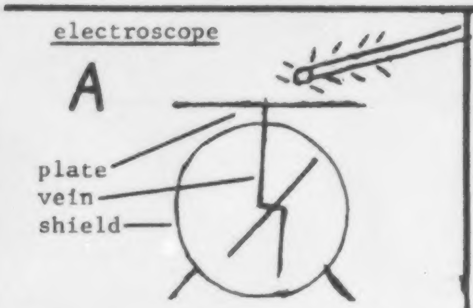
Instructions: This worksheet will help you prepare for the What Charge and Why Game. In questions 1-10, fill in the blanks. In questions 11-24, study the diagrams to answer the questions.

Vocabulary:

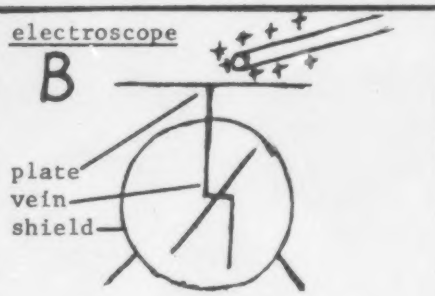
electrical current
electron
negative charge
neutral
positive charge
proton

TGT WORKSHEET: V.1 What Charge and Why?

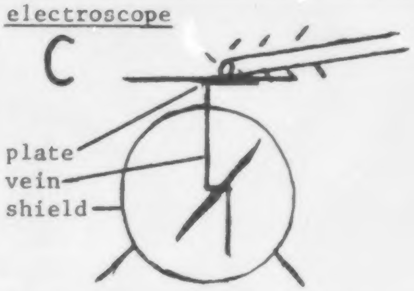
electroscope A



electroscope B



electroscope C



The _______ is a very small particle of matter with a positive charge. 1

The _______ is a very small particle with a negative charge. 2

A neutral object contains equal numbers of _______ and _______. 3

A negatively charged object has more _______ than _______. 4

A positively charged object has more _______ than _______. 5

A neutral object may become positively charged by _______ electrons. 6

A neutral object may become negatively charged by _______ electrons. 7

A negatively charged object may become neutral by _______ electrons. 8

A positively charged object may become neutral by _______ electrons. 9

An object may become negatively or positively charged by gaining or losing _______. 10

In diagram A the electrons move from the _______ to the _______. 11

In diagram A the plate has become _______ charged. 12

In diagram A the vein has become _______ charged. 13

When the rod is removed the electrons will move from the _______ to the _______. 14

The vein and the plate will both become _______. 15

In diagram B the electrons move from the _______ to the _______. 16

In diagram B the plate has become _______ charged. 17

In diagram B the vein has become _______ charged. 18

When the rod is removed in diagram B, the electrons will move from the _______ to the _______. 19

The scope and the plate will both become _______. 20

In diagram C what charge does the plate have? 21

In diagram C what charge does the vein have? 22

When the rod is removed the scope will remain _______ charged. 23

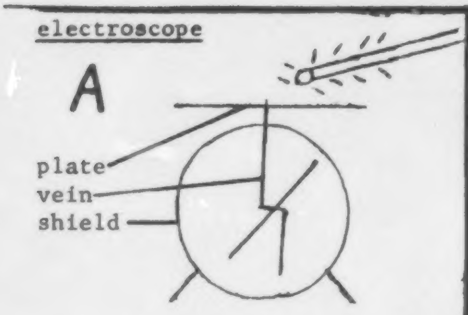
The scope is _______ charged because it has more _______ than protons. 24

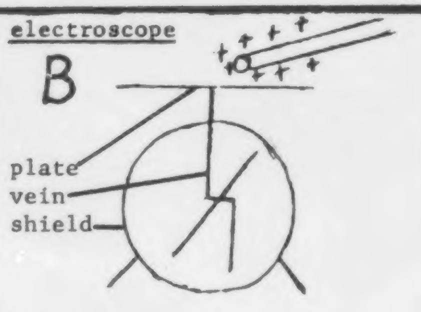
WORKSHEET ANSWERS

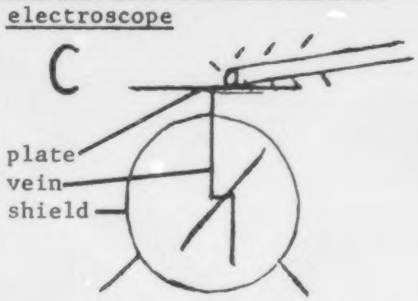
V.1 What Charge and Why?

1. proton
2. electron
3. protons and electrons
4. electrons, protons
5. protons, electrons
6. losing
7. gaining
8. losing
9. gaining
10. electrons
11. plate, scope
12. positively
13. negatively
14. scope, plate
15. neutral
16. scope, plate
17. negatively
18. positively
19. plate, scope
20. neutral
21. negative
22. negative
23. negatively
24. negatively, electrons

TGT GAMESHEET: V.1 What Charge and Why?







A positively charged object may become neutral by _______ electrons. 1

A negatively charged object may become neutral by _______ electrons. 2

A neutral object may become negatively charged by _______ electrons. 3

A neutral object may become positively charged by _______ electrons. 4

A positively charged object has more _______ than _______. 5

A negatively charged object has more _______ than _______. 6

A neutral object contains equal numbers of _______ and _______. 7

The _______ is a very small particle with a negative charge. 8

The _______ is a very small particle of matter with a positive charge. 9

In diagram A the vein and the plate will both become _______. 10

In diagram A, when the rod is removed the electrons will move from the _______ to the _______. 11

In diagram A the vein has become _______ charged. 12

In diagram A the plate has become _______ charged. 13

In diagram A the electrons move from the _______ to the _______. 14

An object may become negatively or positively charged by gaining or losing _______. 15

In diagram C the vein is _______ charged because it has more _______ than protons. 16

When the rod is removed in diagram C, the vein will remain _______ charged. 17

In diagram C what charge does the scope have? 18

In diagram C what charge does the plate have? 19

In diagram B the scope and the plate will both become _______. 20

When the rod is removed in diagram B, the electrons will move from the _______ to the _______. 21

In diagram B the vein has become _______ charged. 22

In diagram B the plate has become _______ charged. 23

In diagram B the electrons move from the _______ to the _______. 24

GAMESHEET ANSWERS

V.1 What Charge and Why?

1. gaining
2. losing
3. gaining
4. losing
5. protons, electrons
6. electrons, protons
7. protons, electrons
8. electron
9. proton
10. neutral
11. scope, plate
12. negatively
13. positively
14. plate, scope
15. electrons
16. negatively, electrons
17. negatively
18. negative
19. negative
20. neutral
21. plate, scope
22. positively
23. negatively
24. scope, plate

TGT PHYSICAL SCIENCE

UNIT: Electricity

WORKSHEET: Ohm's Law

Objective: V.2--a. Students will write and apply Ohm's Law.

b. Students will identify the units and symbols used to measure current, resistance, and electromotive force.

Instructions: This worksheet will help you prepare for the Ohm's Law Game. Read the questions, consult the charts, and provide the correct answers.

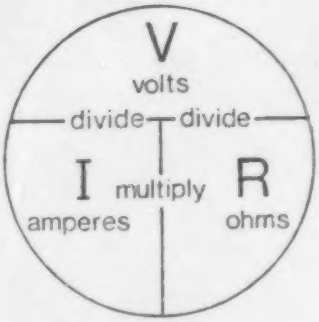
Vocabulary:

electrical resistance
electromotive force (volts)
electrical current

OHM'S LAW

$$I = \frac{V}{R}$$

$$\text{electric current (amperes)} = \frac{\text{electromotive force (volts)}}{\text{resistance (ohms)}}$$



	SYMBOL	UNIT
electromotive force	V	volt
electric current	I	ampere
resistance	R	ohm

TGT WORKSHEET: V.2--Ohm's Law

State Ohm's law in formula using the following words: resistance, current, electromotive force. 1	Give the symbol for electrical resistance. 2	Give the symbol for electrical current. 3
Give the symbol for electromotive force. 4	Give the formula for Ohm's law using the symbols. 5	What is the unit used to measure electrical resistance? 6
What is the unit used to measure electrical current? 7	What is the unit used to measure electromotive force? 8	Express Ohm's law in formula using the units. 9

Complete the chart:

	Symbol	Unit
Electromotive Force	10.	11.
12.	I	13.
14.	15.	Ohm

How much current will flow in a light that uses a 6 volt battery and a bulb with 3 Ohms of resistance? 16	How much current will flow through a circuit if the resistance is equal to 8 Ohms and the electromotive force is 120 volts? 17	A toaster has a resistance of 10 Ohms. How much current will flow if the toaster is in a 120 volt circuit? 18
If you want to find the resistance in a circuit, you can change the formula to read: 19	What is the resistance of a toaster if 110 volts produce a 5 amp current through it? 20	An electrical drill uses 110 volts and 10 amps of electricity. How much resistance does it have? 21
If you want to find the voltage across a circuit, you can change the formula to read: 22	How much voltage is needed to cause a 7 amp current through an electrical heater that has a resistance of 16 Ohms? 23	A rheostat has a resistance of 20 Ohms. What EMF will be needed if the current in the rheostat is 4 amperes? 24

WORKSHEET ANSWERS

V.2 Ohm's Law

1. Current $= \frac{\text{Electromotive force}}{\text{Resistance}}$
2. R
3. I
4. V
5. $I = \frac{V}{R}$
6. Ohm
7. ampere
8. volt
9. amperes $= \frac{\text{volts}}{\text{Ohms}}$
10. V
11. volts
12. electric current
13. ampere
14. resistance
15. R
16. 2 amperes
17. 15 amperes
18. 12 amperes
19. $R = \frac{V}{I}$
20. 22 Ohms
21. 11 Ohms
22. $V = I \times R$
23. 112 volts
24. 80 volts

TGT GAMESHEET: V.2 Ohm's Law

State Ohm's law in formula form using the following words: resistance, current and electromotive force. 1	Give the symbol for electrical current. 2	Give the symbol for electrical resistance. 3
Give the formula for Ohm's law using the symbols. 4	Give the symbol for electromotive force. 5	What is the unit used to measure electrical current? 6
What is the unit used to measure electrical resistance? 7	Express Ohm's law in formula using the units. 8	What is the unit used to measure electromotive force? 9
Electromotive force is measured in units called __________. 10	The symbol for volts is __________. 11	The measurement unit is Ohms. The symbol is __________. 12
"I" is a symbol for __________. 13	What unit is used to measure I? 14	If you are using Ohms, you are measuring __________. 15
How much current will flow through a circuit if the resistance is equal to 10 Ohms and the electromotive force is 120 volts? 16	How much current will flow in a light that uses a 12 volt battery and a bulb with 4 Ohms of resistance? 17	If you want to find the resistance in a circuit, you can change the formula to read: 18
A toaster has a resistance of 10 Ohms. How much current will flow if the toaster is in a 120 volt circuit? 19	An electrical drill uses 110 volts and 10 amps of electricity. How much resistance does it have? 20	What is the resistance of a toaster if 120 volts produce a 6 amp current through it? 21
How many volts are needed to push 7 amps through an electrical heater that has a resistance of 16 Ohms? 22	If you want to find the voltage in a circuit, you can change the formula to read: 23	A rheostat has a resistance of 15 Ohms. What EMF will be needed if the current in the rheostat is 3 amperes? 24

GAMESHEET ANSWERS

V.2 Ohm's Law

1. Current = $\frac{\text{Electromotive force}}{\text{Resistance}}$
2. I
3. R
4. $I = \frac{V}{R}$
5. V
6. ampere
7. Ohm
8. amperes = $\frac{\text{volts}}{\text{Ohms}}$
9. volt
10. volts
11. V
12. R
13. current
14. ampere
15. resistance
16. 12 amperes
17. 3 amperes
18. $R = \frac{V}{I}$
19. 12 amperes
20. 11 Ohms
21. 20 Ohms
22. 112 volts
23. $V = I \times R$
24. 45 volts

TGT PHYSICAL SCIENCE

UNIT: Electricity

WORKSHEET: General Circuits

Objective: V.3--a. Students will distinguish between a series and a parallel circuit.
b. Students will calculate the voltage and resistance in parallel and series circuits.
c. Students will identify an open or closed circuit.

Instructions: This worksheet will help you prepare for the General Circuits Game. Provide the correct answer for each item. The game will be similar, but some of the items will vary.

Vocabulary:

circuit
closed circuit
open circuit
parallel circuit
resistance
series circuit
voltage

TGT WORKSHEET: V.3 General Circuits

An electric __________ is a path through which current can flow.

1

A __________ circuit is a one-path circuit.

2

A __________ circuit may have several paths or branches.

3

In a __________ circuit, if one light burns out they all go out.

4

In a __________ circuit, if one light burns out the rest remain on.

5

The current is the same in every part of a __________ circuit.

6

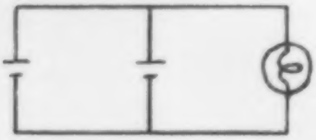
When cells are connected in a __________ circuit, the total voltage increases.

7

When cells are connected in a __________ circuit, the voltage does not change.

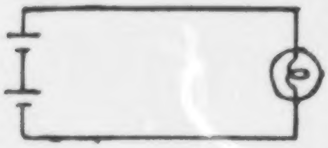
8

In this diagram the cells are in a __________ circuit.



9

In this diagram the cells are in a __________ circuit.



10

If the cells in #9 are 1.5V each, how many volts are there across the bulb?

11

If the cells in #10 are 1.5V each, how many volts are there across the bulb?

12

If four 1.5V cells were connected in series, the total voltage output would be __________.

13

If four 1.5V cells were connected in parallel, the total voltage output would be __________.

14

As more lights are added to a __________ circuit the lights become dimmer.

15

TGT WORKSHEET: V.3 General Circuits

Diagram A: String of Christmas tree bulbs in series

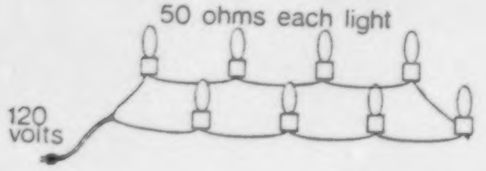


Diagram B: Two bulbs in parallel

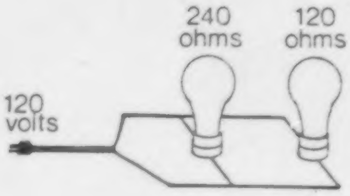
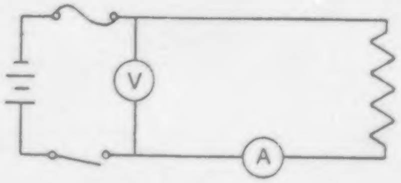


Diagram C:



If one of the lamps burns out in diagram A, will the others remain lit? 16

If the 240-Ohm lamp burns out in diagram B, will the 120-Ohm lamp remain lit? 17

In which circuit is it easier to find a burned-out bulb? 18

What is the total resistance of the lamps in A? 19

Is the voltmeter in diagram C connected in parallel or series with the resistor? 20

Is the ammeter in diagram C connected in parallel or series with the resistor? 21

Are the cells in diagram C connected in series or parallel? 22

If each cell in diagram C has a voltage of 1.5, how many volts are there across the circuit? 23

Is the circuit in diagram C open or closed? 24

WORKSHEET ANSWERS

V.3 General Circuits

1. circuit
2. series
3. parallel
4. series
5. parallel
6. series
7. series
8. parallel
9. parallel
10. series
11. 1.5V
12. 3V
13. 6V
14. 1.5V
15. series
16. No
17. Yes
18. B
19. 400 Ohms
20. parallel
21. series
22. series
23. 3 Volts
24. open

TGT GAMESHEET: V.3 General Circuits

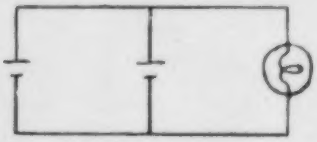
If four 1.5V cells were connected in parallel, the total voltage output would be __________.

1

As more lights are added to a __________ circuit the lights become dimmer.

2

In this diagram the cells are in a __________ circuit.

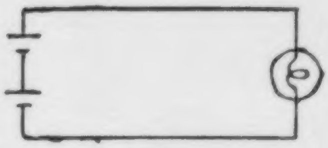


3

If the cells in #3 are 1.5V each, how many volts are flowing through the bulb?

4

In this diagram the cells are in a __________ circuit.



5

If the cells in #5 are 1.5V each, how many volts are flowing through the bulb?

6

In a __________ circuit, if one light burns out they all go out.

7

In a __________ circuit, if one light burns out the rest remain on.

8

The current is the same in every part of a __________ circuit.

9

When cells are connected in a __________ circuit, the voltage increases.

10

When cells are connected in a __________ circuit, the voltage does not change.

11

If four 1.5V cells were connected in series, the total voltage output would be __________.

12

An electric __________ is a path through which electrons can flow.

13

A __________ circuit is a one-path circuit.

14

A __________ circuit may have several paths or branches.

15

TGT GAMESHEET: V.3 General Circuits

Diagram A: String of Christmas tree bulbs in series

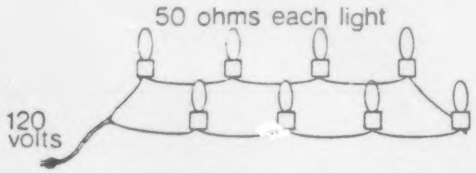


Diagram B: Two bulbs in parallel

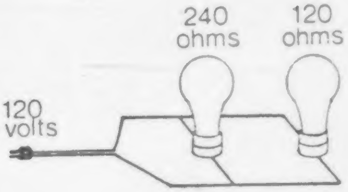
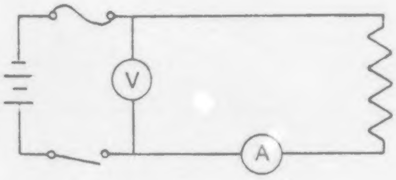


Diagram C:



If one of the lamps burns out in diagram A, will the others remain lit? 16

If the 240-Ohm lamp burns out in diagram B, will the the 120-Ohm lamp remain lit? 17

In which circuit is it easier to find a burned-out bulb? 18

What is the total resistance of the lamps in A? 19

Is the voltmeter in diagram C connected in parallel or series with the resistor? 20

Is the ammeter in diagram C connected in parallel or series with the resistor? 21

Are the cells in diagram C connected in series or parallel? 22

If each cell in diagram C has a voltage of 1.5, how many volts are there across the circuit? 23

Is the circuit in diagram C open or closed? 24

GAMESHEET ANSWERS

V.3 General Circuits

1. 1.5
2. series
3. parallel
4. 1.5V
5. series
6. 3V
7. series
8. parallel
9. parallel
10. series
11. parallel
12. 6V
13. circuit
14. series
15. parallel
16. No
17. Yes
18. B
19. 400 Ohms
20. parallel
21. series
22. series
23. 3 Volts
24. open

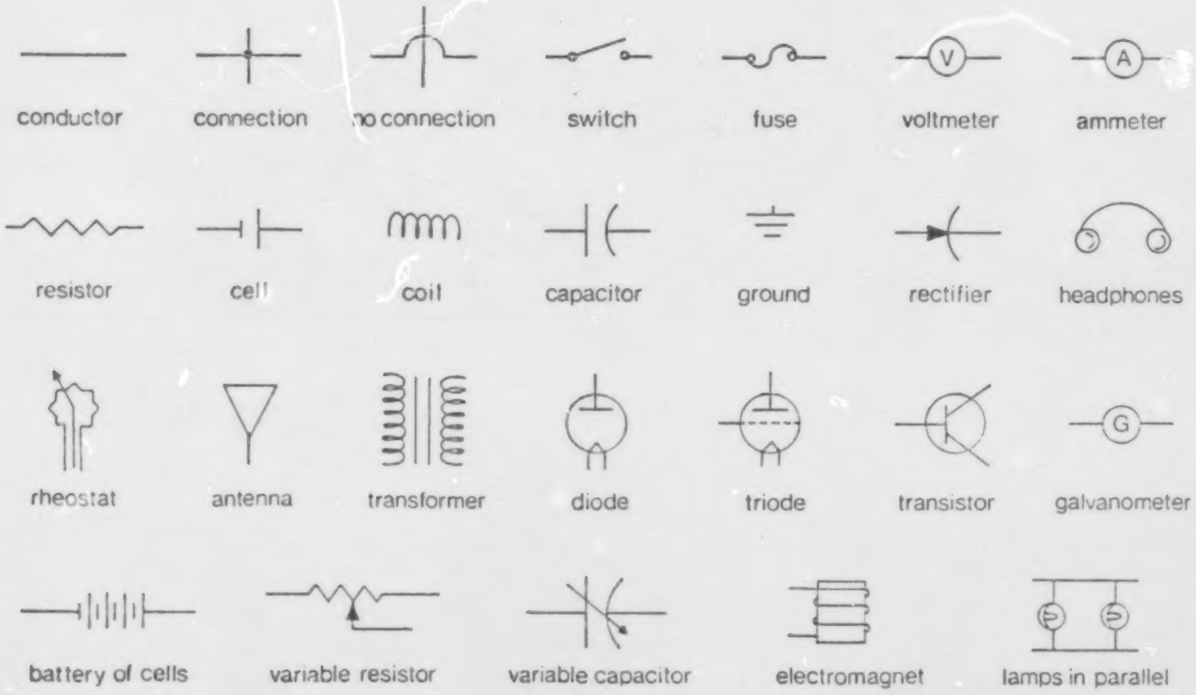
TGT PHYSICAL SCIENCE
UNIT: Electricity
WORKSHEET: Electrical Symbols

Objective: V.4--Students will identify electrical symbols.

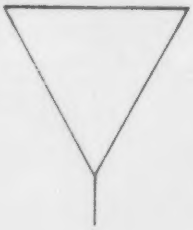
Instructions: This worksheet will help you prepare for the Electrical Symbols Game. Use the vocabulary and diagram and write the name of the symbol on the line provided in each item. You will not have the use of the vocabulary and diagram below for the tournament.

Vocabulary

SYMBOLS USED TO DIAGRAM ELECTRONIC CIRCUITS


conductor
connection
no connection
switch
fuse
V
voltmeter
A
ammeter
resistor
cell
coil
capacitor
ground
rectifier
headphones
rheostat
antenna
transformer
diode
triode
transistor
G
galvanometer
battery of cells
variable resistor
variable capacitor
electromagnet
lamps in parallel

TGT WORKSHEET: V.4 Electrical Symbols



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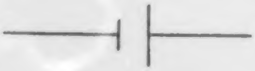

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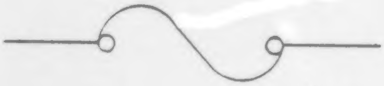

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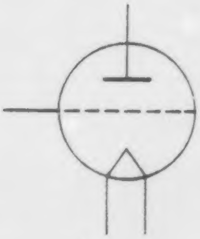

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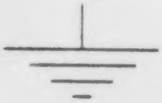

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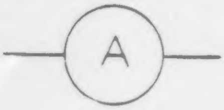

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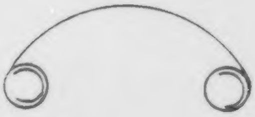

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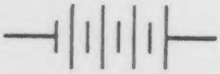

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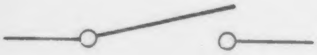

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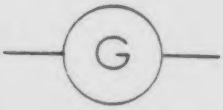

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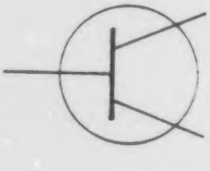

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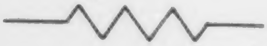

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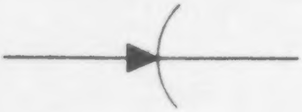
TGT WORKSHEET: V.4 Electrical Symbols



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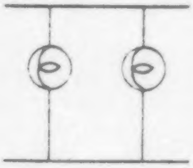

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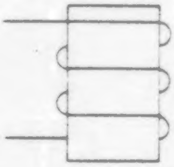

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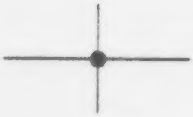

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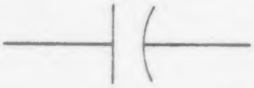

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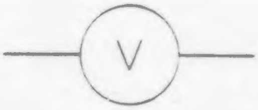

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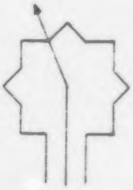

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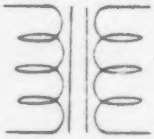

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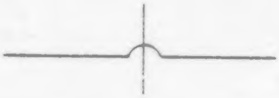

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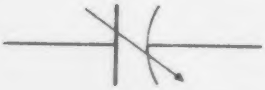

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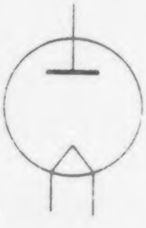

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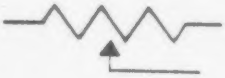


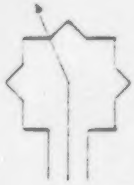
24 ____________________

WORKSHEET ANSWERS

V.4 Electrical Symbols

1. antenna
2. cell
3. fuse
4. triode
5. ground
6. ammeter
7. earphones
8. battery
9. switch
10. galvanometer
11. transitor
12. resistor
13. rectifier
14. lamps in parallel
15. electromagnet
16. connection
17. capacitor
18. voltmeter
19. rheostat
20. transformer
21. non connection or crossover
22. variable capacitor
23. diode
24. variable resistor

TGT GAMESHEET: V.4 Electrical Symbols



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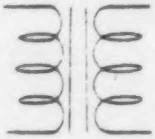

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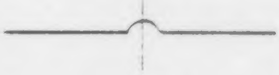

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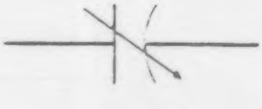

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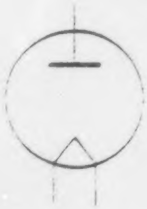

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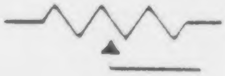

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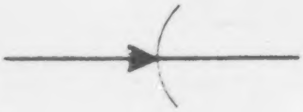

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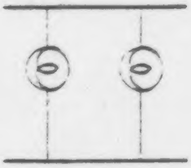

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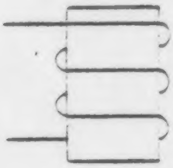

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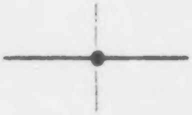

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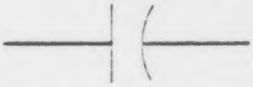

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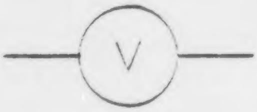

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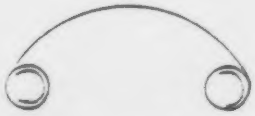

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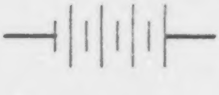

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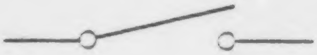
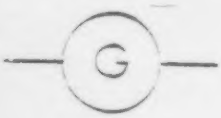


15

TGT GAMESHEET: V.4 Electrical Symbols



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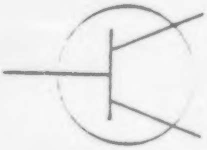

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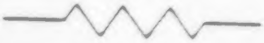

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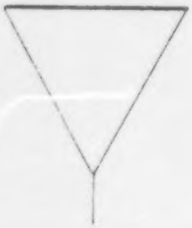

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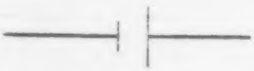

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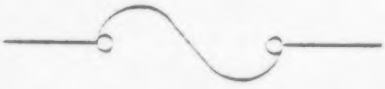

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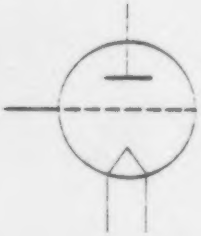

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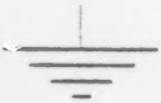

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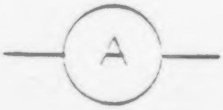


24

GAMESHEET ANSWERS

V.4 Electrical Symbols

1. rheostat
2. transformer
3. non connection or crossover
4. variable capacitor
5. diode
6. variable resistor
7. rectifier
8. lamps in parallel
9. electromagnet
10. connection
11. capacitor
12. voltmeter
13. earphones
14. battery
15. switch
16. galvanometer
17. transitor
18. resistor
19. antenna
20. cell
21. fuse
22. triode
23. ground
24. ammeter

TGT PHYSICAL SCIENCE

UNIT: Electricity

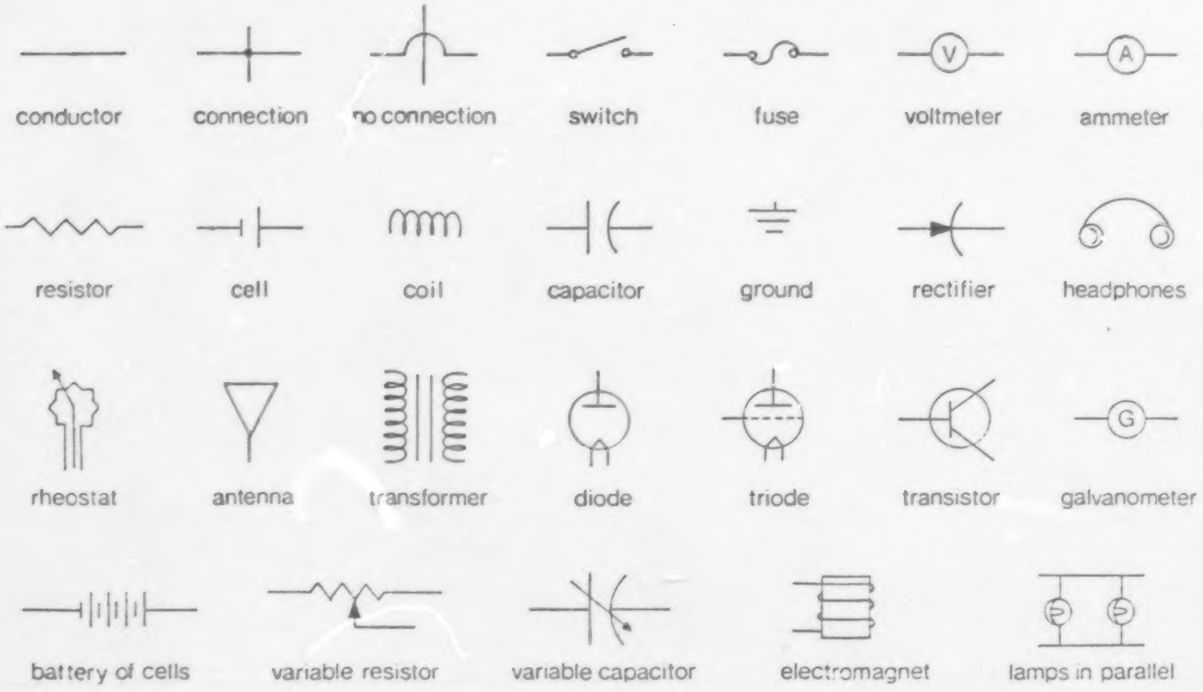
WORKSHEET: Electronic Circuits

Objective: V.5--a. Students will identify the parts of a radio circuit.
b. Students will identify the function of each part of a radio circuit.

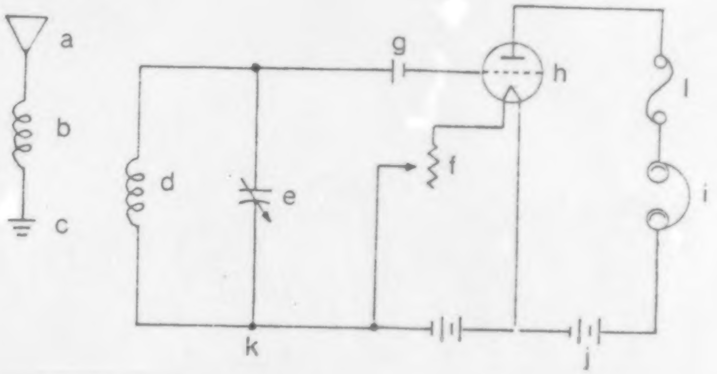
Instructions: This worksheet will help you prepare for the Electronic Circuits Game. In items 1-12, identify the parts of the radio circuit pictured on the worksheet. In items 13-20, give the function of the named part.

Vocabulary:

SYMBOLS USED TO DIAGRAM ELECTRONIC CIRCUITS


conductor
connection
no connection
switch
fuse
V
voltmeter
A
ammeter
resistor
cell
coil
capacitor
ground
rectifier
headphones
rheostat
antenna
transformer
diode
triode
transistor
G
galvanometer
battery of cells
variable resistor
variable capacitor
electromagnet
lamps in parallel

TGT WORKSHEET: V.5 Electronic Circuits



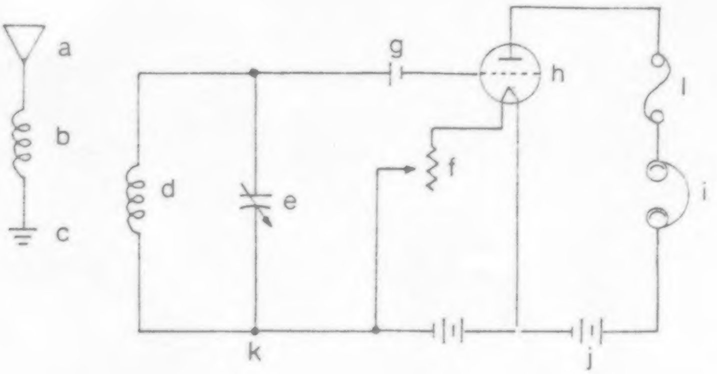
Part (a) is: 1	Part (b) is: 2	Part (c) is: 3
Part (d) is: 4	Part (e) is: 5	Part (f) is: 6
Part (g) is: 7	Part (h) is: 8	Part (i) is: 9
Part (j) is: 10	Part (k) is: 11	Part (l) is: 12
triode 13	earphones 14	coil 15
variable resistor 16	fuse 17	battery 18
variable condensor 19	antenna 20	

WORKSHEET ANSWERS

V.5 Electronic Circuits

1. antenna
2. coil
3. ground
4. coil
5. variable capacitor
6. variable resistor
7. cell
8. triode
9. earphones
10. battery
11. connection
12. fuse
13. amplifies the current
14. change electrical energy to sound energy
15. changes radio waves into weak alternating current
16. controls direct current to triode
17. protects earphones from an overload
18. produces direct current for triode
19. increases alternative current from coils
20. picks up radio waves

TGT GAMESHEET: V.5 Electronic Circuits



Part (b) is: 1	Part (e) is: 2	Part (h) is: 3
Part (k) is: 4	What is the function of earphones? 5	What is the function of a fuse? 6
What is the function of an antenna? 7	What is the function of a battery? 8	What is the function of a coil? 9
Part (l) is: 10	Part (i) is: 11	Part (f) is: 12
Part (c) is: 13	What is the function of a variable condensor? 14	What is the function of a variable resistor? 15
What is the function of a triode? 16	Part (j) is: 17	Part (g) is: 18
Part (d) is: 19	Part (a) is: 20	

GAMESHEET ANSWERS

V.5 Electronic Circuits

1. coil
2. variable capacitor
3. triode
4. connection
5. change electrical energy to sound energy
6. protects earphones from an overload
7. picks up radio waves
8. produces direct current for triode
9. changes radio waves into weak alternative current
10. fuse
11. earphones
12. variable resistor
13. ground
14. increases alternating current from coils
15. controls direct current to triode
16. amplifies the current
17. battery
18. cell
19. coil
20. antenna

TGT PHYSICAL SCIENCE

UNIT: Electricity

WORKSHEET: Electricity Vocabulary Review

Objective: V.6--Students will be able to define words necessary for understanding electrical concepts.

Instructions: This worksheet will help you prepare for the Electricity Vocabulary Review Game. Using the word list, provide the correct word to match the definition. The same words and definitions will be used in the game.

Vocabulary:

alternating current
ampere
battery
capacitor
circuit
conductor
cell (dry)
current
direct current
electron
electromotive force
electroscope
fuse
galvanometer
generator
induce
induction coil
insulator
magnetic field
ohm
parallel circuit
rectifier
resistance
rheostat
series circuit
transformer
triode tube
volt
voltmeter
watt

TGT WORKSHEET: V.6 Electricity Vocabulary Review

Device for changing the strength of an electric current by changing the resistance in the circuit. 1	A current that always flows in the same direction. 2	To produce an electric current or to magnetize without making contact with the object. 3
Space around a magnet in which a magnetic force can be detected. 4	A device used to raise or lower electrical voltage. 5	A unit of electrical resistance. 6
A machine for changing mechanical energy into electrical energy. 7	A device that changes alternating current to direct current. 8	The opposition of a conductor to the flow of a current. 9
Used to store an electrical charge. 10	A device for producing a current with moist chemicals. 11	A circuit that has more than one path for the circuit. 12
An instrument used for measuring electromotive force or voltage. 13	A complete path over which a current may flow. 14	Unit used to measure power. 15
One unit of negative electricity. 16	A circuit containing a single path. 17	A substance used to prevent the escape of electricity or heat. 18
A current that changes its direction regularly. 19	Two or more cells connected in a series. 20	Vacuum tube used to amplify or rectify. 21
Part of an electric circuit that melts and breaks the circuit if the current becomes dangerously high. 22	An electrical device of two separate coils used for increasing a voltage. 23	An instrument used for measuring a small electric current. 24
Instrument used to detect electrical charges. 25	The "push" behind electrons in a wire; also called voltage. 26	A substance through which electricity can flow. 27
A unit used to measure electric current. 28	A unit used to measure electric pressure (EMF). 29	The flow of electrons through a conductor. 30

WORKSHEET ANSWERS

V.6 Electricity Vocabulary Review

1. rheostat
2. direct current
3. induce
4. magnetic field
5. transformer
6. Ohm
7. generator
8. rectifier
9. resistance
10. capacitor
11. dry cell
12. parallel circuit
13. voltmeter
14. circuit
15. watt
16. electron
17. series circuit
18. insulator
19. alternating current
20. battery
21. triode
22. fuse
23. induction coil
24. galvanometer
25. electroscope
26. electromotive force
27. conductor
28. ampere
29. volt
30. current

TGT GAMESHEET: V.6 Electricity Vocabulary Review

Device for changing the strength of an electric current by changing the resistance in the circuit. 1	Space around a magnet in which a magnetic force can be detected. 2	A machine for changing mechanical energy into electrical energy. 3
Used to store an electrical charge. 4	An instrument used for measuring electromotive force or voltage. 5	One unit of negative electricity. 6
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A circuit containing a single path. 16	Two or more cells connected in a series. 17	An electrical device of two separate coils used for increasing a voltage. 18
The "push" behind electrons in a wire; also called voltage. 19	The flow of electrons through a conductor. 20	To produce an electric current or to magnetize without making contact with the object. 21
A unit of electrical resistance. 22	The opposition of a conductor to the flow of a current. 23	A circuit that has more than one path for the circuit. 24
Unit used to measure power. 25	A substance used to prevent the escape of electricity or heat. 26	Vacuum tube used to amplify or rectify. 27
An instrument used for measuring a small electric current. 28	A substance through which electricity can flow. 29	A unit used to measure electric current. 30

GAMESHEET ANSWERS

V.6 Electricity Vocabulary Review

1. rheostat
2. magnetic field
3. generator
4. capacitor
5. voltmeter
6. electron
7. alternating current
8. fuse
9. electroscope
10. volt
11. direct current
12. transformer
13. rectifier
14. dry cell
15. circuit
16. series circuit
17. battery
18. induction coil
19. electromotive force
20. current
21. induce
22. Ohm
23. resistance
24. parallel circuit
25. watt
26. insulator
27. triode
28. galvanometer
29. conductor
30. ampere

TGT PHYSICAL SCIENCE

UNIT: Measurement

WORKSHEET: The Metric System

Objective: VI.1--a. Students will identify and use the basic units for measuring length, volume, area and mass in the metric system.

b. Students will compute the conversion of units within the metric system.

Instructions: This worksheet will help you prepare for the Metric System Game. In numbers 1-15, circle the correct answer. In numbers 16-30, write the correct answer in the space provided.

Vocabulary:

Basic Units of the Metric System

Mass - gram (g)
Volume - liter (L) = 1,000 cm^3
Length - meter (m)
Area - $length^2$ = m^2

Some Important Prefixes

Prefix	Example
centi = 1/100	1 centimeter (cm) = 1/100 of a meter
milli = 1/1000	1 milliliter (ml) = 1/1000 of a liter
kilo = 1000	1 kilogram (kg) = 1000 grams
deci = 1/10	1 decimeter = 1/10 of a meter

TGT WORKSHEET: VI.1 The Metric System

The basic unit of mass is:

a. the meter
b. the liter
c. the gram
d. the newton

1

The basic unit of volume is:

a. the meter
b. the liter
c. the gram
d. the newton

2

The basic unit used to measure length is:

a. the meter
b. the liter
c. the gram
d. the newton

3

The prefix for 1/100 in the metric system is:

a. centi-
b. milli-
c. mega-
d. kilo-

4

The prefix for 1/1000 in the metric system is:

a. centi-
b. milli-
c. mega-
d. kilo-

5

The prefix for 1,000 in the metric system is:

a. centi-
b. milli-
c. mega-
d. kilo-

6

An instrument used in the lab to accurately measure volume is the:

a. test tube
b. balance
c. graduated cylinder
d. beaker

7

The unit used to measure a long distance is:

a. the kilometer
b. the centimeter
c. the kilogram
d. the decimeter

8

The abbreviation for centimeter is:

a. cc
b. c
c. cm
d. dm

9

The abbreviation for kilogram is:

a. k
b. kg
c. kl
d. ki

10

The abbreviation for millimeter is:

a. m
b. mm
c. ml
d. mi

11

If you multiply a centimeter by a centimeter, the resulting unit is:

a. cc
b. cm
c. cm^2
d. c^3

12

The abbreviation for decimeter is:

a. cm
b. cm^2
c. dm^2
d. dm

13

How many decimeters are in a meter?

a. 10
b. 100
c. 20
d. 1000

14

How many centimeters are in a decimeter?

a. 10
b. 100
c. 20
d. 1000

15

TGT WORKSHEET: VI.1 The Metric System

350 mm would equal ______ cm. 16	350 cm would equal _____ m. 17	What is the area of a rectangle 5 cm by 10 cm? 18
How many milliliters are in a liter? 19	3,500 ml would equal how many liters? 20	How many ml are in 2.8 liters? 21
How many grams in 4 kilograms? 22	5200 grams are equal to _____ kg. 23	A cm^3 and a ______ are equal. 24
How many centimeters are in a meter? 25	How many millimeters are in a meter? 26	How many millimeters are in a centimeter? 27
How many $centimeters^2$ (cm^2) would be in a $decimeter^2$ (dm^2)? 28	How many $centimeters^2$ (cm^2) in a $meter^2$ (m^2)? 29	How many milliliters (ml) in a deciliter (dl)? 30

WORKSHEET ANSWERS

VI.1 The Metric System

1. c) the gram
2. b) the liter
3. a) the meter
4. a) centi-
5. b) milli-
6. d) kilo-
7. c) graduated cylinder
8. a) the kilometer
9. c) cm
10. b) kg
11. b) mm
12. c) cm^2
13. d) dm
14. a) 10
15. a) 10
16. 35
17. 3.5
18. 50 cm^2
19. 1,000
20. 3.5
21. 2,800
22. 4,000
23. 5.2
24. ml or cc
25. 100
26. 1,000
27. 10
28. 100
29. 10,000
30. 100

TGT GAMESHEET: VI.1 The Metric System

A cc and a ______ are equal.

1

5200 grams are equal to ______ kg.

2

How many grams in 4 kilograms?

3

How many ml are in 3.6 liters?

4

3,500 ml would equal how many liters?

5

How many milliliters are in a liter?

6

What is the area of a rectangle 5 cm by 10 cm?

7

550 cm would equal ______ m.

8

450 mm would equal ______ cm.

9

How many millimeters are in a centimeter?

10

How many millimeters are in a meter?

11

How many centimeters are in a meter?

12

If you multiply a centimeter by a centimeter, the resulting unit is:

a. cm^2
b. c
c. cm

13

The abbreviation for millimeter is:

a. m
b. mm
c. ml

14

The abbreviation for kilogram is:

a. k
b. kg
c. kl

15

TGT GAMESHEET: VI.1 The Metric System

The abbreviation for centimeter is:

a. cc
b. c
c. cm

16

The unit used to measure a long distance is the:

a. kilometer
b. centimeter
c. kilogram

17

An instrument used in the lab to accurately measure volume is the:

a. test tube
b. balance
c. graduated cylinder

18

The prefix for 1,000 in the metric system is:

a. centi-
b. milli-
c. mega-
d. kilo-

19

The prefix for 1/1000 in the metric system is:

a. centi-
b. milli-
c. mega-
d. kilo-

20

The prefix for 1/100 in the metric system is:

a. centi-
b. milli-
c. mega-
d. kilo-

21

The basic unit used to measure length is the:

a. meter
b. liter
c. gram
d. newton

22

The basic unit used to measure volume is the:

a. meter
b. liter
c. gram
d. newton

23

The basic unit used to measure mass is the:

a. meter
b. liter
c. gram
d. newton

24

How many cm^2 would be in a dm^2?

25

How many ml in a dl?

26

How many cm^2 in a m^2?

27

The abbreviation for decimeter is:

28

How many decimeters are in a meter?

29

How many centimeters are in a meter?

30

GAMESHEET ANSWERS

VI.1 The Metric System

1. ml or cm^3
2. 5.2
3. 4,000
4. 3,600
5. 3.5
6. 1,000
7. 50 cm^2
8. 5.5
9. 45
10. 10
11. 1,000
12. 100
13. a) cm^2
14. b) mm
15. b) kg
16. c) cm
17. a) kilometer
18. c) graduated cylinder
19. d) kilo-
20. b) milli-
21. a) centi-
22. a) meter
23. b) liter
24. c) gram
25. 100 cm^2
26. 100 ml
27. 10,000 cm^2
28. dm
29. 10
30. 100

TGT PHYSICAL SCIENCE

UNIT: Measurement

WORKSHEET: Scientific Notation

Objective: VI.2--a. Students will express large numbers in scientific notation form.

b. Students will convert scientific notation to regular numbers.

Instructions: This worksheet will help you prepare for the Scientific Notation Game. In numbers 1-10, express in proper scientific notation. In numbers 11-24, write the correct number.

TGT WORKSHEET: VI.2 Scientific Notation

6,000 ____ x ____ 1	200,000,000 ____ x ____ 2	186,000 ____ x ____ 3
93,000,000 ____ x ____ 4	1,200 ____ x ____ 5	1,500,000 ____ x ____ 6
0.06 ____ x ____ 7	.00086 ____ x ____ 8	0.56 ____ x ____ 9
0.0047 ____ x ____ 10	6.2×10^2 ________ 11	8.4×10^6 ________ 12
4.32×10^3 ________ 13	7.2×10^7 ________ 14	1.6×10^9 ________ 15
4.2×10^{-3} ________ 16	5.6×10^{-5} ________ 17	3.44×10^{-5} ________ 18
7.65×10^{-2} ________ 19	9.3×10^{-7} ________ 20	10^{-3} ________ 21
10^{-5} ________ 22	10^4 ________ 23	10^7 ________ 24

WORKSHEET ANSWERS

VI.2 Scientific Notation

1. 6×10^{3}
2. 2×10^{8}
3. 1.86×10^{5}
4. 9.3×10^{7}
5. 1.2×10^{3}
6. 1.5×10^{6}
7. 6×10^{-2}
8. 8.6×10^{-4}
9. 5.6×10^{-1}
10. 4.7×10^{-3}
11. 620
12. 8,400,000
13. 4,320
14. 72,000,000
15. 1,600,000,000
16. .0042
17. .000056
18. .0000344
19. .0765
20. .00000093
21. .001
22. .00001
23. 10,000
24. 10,000,000

TGT GAMESHEET: VI.2 Scientific Notation

60,000 6 x ____ 1	800,000,000 8 x ____ 2	186,000 1.86 x ____ 3
93,000,000 9.3 x ____ 4	1,500 1.5 x ____ 5	2,500,000 2.5 x ____ 6
0.03 3 x ____ 7	.00037 3.7 x ____ 8	0.72 7.2 x ____ 9
0.0038 3.8 x ____ 10	2.6×10^2 ________ 11	4.8×10^6 ________ 12
2.34×10^3 ________ 13	2.7×10^7 ________ 14	1.6×10^9 ________ 15
8.4×10^{-3} ________ 16	3.1×10^{-5} ________ 17	6.88×10^{-5} ________ 18
4.21×10^{-2} ________ 19	6.3×10^{-7} ________ 20	10^{-3} ________ 21
10^{-4} ________ 22	10^5 ________ 23	10^6 ________ 24

GAMESHEET ANSWERS

VI.2 Scientific Notation

1. 6×10^{4}
2. 8×10^{8}
3. 1.86×10^{5}
4. 9.3×10^{7}
5. 1.5×10^{3}
6. 2.5×10^{6}
7. 3×10^{-2}
8. 3.7×10^{-4}
9. 7.2×10^{-1}
10. 3.8×10^{-3}
11. 260
12. 4,800,000
13. 2,340
14. 27,000,000
15. 1,600,000,000
16. .0084
17. .000031
18. .0000688
19. .0421
20. .00000063
21. .001
22. .0001
23. 100,000
24. 1,000,000